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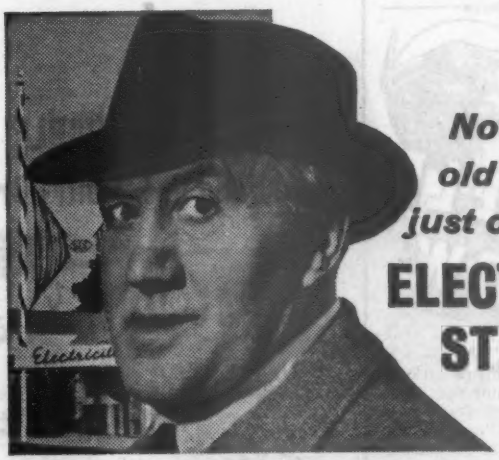

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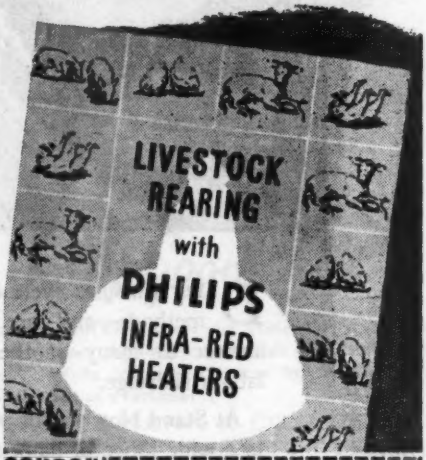

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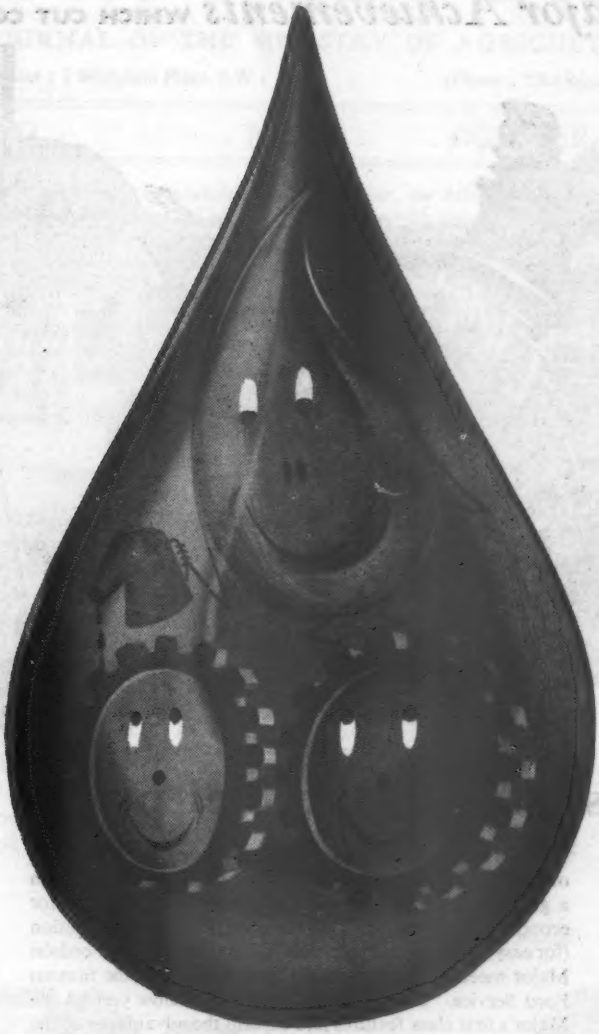

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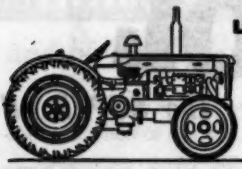

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VOL. LXI No. 7 OCTOBER 1954

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VOL. LXI No. 7 OCTOBER 1954

MYXOMATOSIS : RECENT DEVELOPMENTS

HARRY V. THOMPSON

Infestation Control Division, Ministry of Agriculture and Fisheries

In an earlier article* in this JOURNAL Mr. Thompson dealt in general terms with the first unsuccessful efforts to use myxomatosis as a method of rabbit control, and traced the history of its introduction into Australia, the outbreaks in France and its later spread to other parts of Europe, including Britain. He now brings his account up to date with this review of its spread during the spring and summer in Britain and certain other affected countries.

IT is as well to emphasize straight away that no *official* attempt has ever been made to introduce myxomatosis on to the mainland of Britain and that every effort was made, by the erection of rabbit-proof netting and by rabbit destruction, to contain the disease after its first notification in Kent in October 1953. Nevertheless, it is now common knowledge that, in spite of the determined steps taken, further outbreaks soon occurred in widely separated areas.

The Advisory Committee on Myxomatosis, appointed by the Minister of Agriculture and Secretary of State for Scotland on November 3, 1953, presented its first report in March. Having considered the history and behaviour of myxomatosis, the cost of the wild rabbit to agriculture and forestry, the trade in fur felt and rabbit meat, the claims of domestic rabbit-keepers, and the humanitarian aspects of the problem, the Committee concluded that attempts to restrict the spread of the disease from the centres at which it was established would serve no practical purpose, but that no attempt should be made to assist its spread or to introduce it into unaffected areas of the country. At a meeting towards the end of July, the Committee reaffirmed this view. They are meeting again in the autumn to consider the matter further in the light of developments.

Myxomatosis survived the winter of 1953-54 in England, but did not spread beyond the south-eastern counties of Kent, East Sussex, Essex and East Suffolk, and by the end of February there were no more than eleven quite small areas of infection. Despite the fact that recent attempts to introduce myxomatosis into two countries having a cool climate—Tasmania and New Zealand—were relatively ineffective, the spread of the disease across France and into neighbouring countries suggested that an epizootic in Britain in the spring and summer was a strong possibility. Although we have not had a true epizootic, the disease is nevertheless present in many parts of the country.

Except for an outbreak in the Isle of Wight in March, myxomatosis was not reported in Britain beyond the south-eastern counties until May, when

*Myxomatosis of Rabbits. February 1954, 60, 503-8.

isolated outbreaks were reported as far apart as Radnor, Cornwall and Norfolk. The disease spread slowly in individual areas, but continued to appear in new and separate places, until by the end of June there were 78 outbreaks in nineteen counties; by July, outbreaks totalled 167 in forty-two counties, and by August 255 in sixty-one counties, including 15 outbreaks in ten counties in Scotland.

Outbreaks of Myxomatosis, October 13, 1953-August 31, 1954 : in Order of Occurrence.
(every fresh outbreak is at least five miles from an existing outbreak)

	1953			1954						
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.
Kent	1	1	1	1	2	1	2	4	1	–	–
E. Sussex	1	1	–	–	–	1	1	1	1	–	–
Essex	–	1	1	1	–	1	–	1	2	–	3
E. Suffolk	–	–	1	–	–	–	2	1	2	–	–
I. of W.	–	–	–	–	–	1	–	–	1	2	–
Radnor	–	–	–	–	–	–	–	1	–	1	1
Glos	–	–	–	–	–	–	–	1	6	5	–
Cornwall	–	–	–	–	–	–	–	1	7	5	–
Beds	–	–	–	–	–	–	–	1	1	1	–
W. Suffolk	–	–	–	–	–	–	–	1	–	3	–
W. Sussex	–	–	–	–	–	–	–	1	1	2	1
Norfolk	–	–	–	–	–	–	–	1	4	5	7
Pembs	–	–	–	–	–	–	–	–	4	1	–
Anglesey	–	–	–	–	–	–	–	–	4	1	–
Devon	–	–	–	–	–	–	–	–	5	10	6
Cards	–	–	–	–	–	–	–	–	1	2	1
Oxford	–	–	–	–	–	–	–	–	1	2	–
Bucks	–	–	–	–	–	–	–	–	1	2	1
Berks	–	–	–	–	–	–	–	–	1	2	2
Lincs (Lind.)	–	–	–	–	–	–	–	–	–	4	3
Brecon	–	–	–	–	–	–	–	–	–	3	–
Warwick	–	–	–	–	–	–	–	–	–	2	–
Hereford	–	–	–	–	–	–	–	–	–	1	2
Caerns	–	–	–	–	–	–	–	–	–	3	2
Carm	–	–	–	–	–	–	–	–	–	4	1
Flint	–	–	–	–	–	–	–	–	–	1	1
Kincardine	–	–	–	–	–	–	–	–	–	1	1
Dorset	–	–	–	–	–	–	–	–	–	1	2
Northants	–	–	–	–	–	–	–	–	–	3	2
Notts	–	–	–	–	–	–	–	–	–	1	1
Salop	–	–	–	–	–	–	–	–	–	2	5
Somerset	–	–	–	–	–	–	–	–	–	4	4
Worcs	–	–	–	–	–	–	–	–	–	1	3
Herts	–	–	–	–	–	–	–	–	–	2	1
Denbigh	–	–	–	–	–	–	–	–	–	2	2
Wilts	–	–	–	–	–	–	–	–	–	1	3
Merioneth	–	–	–	–	–	–	–	–	–	1	–
Lincs (Kest.)	–	–	–	–	–	–	–	–	–	1	–
Surrey	–	–	–	–	–	–	–	–	–	2	1
Hants	–	–	–	–	–	–	–	–	–	3	6
Cambs	–	–	–	–	–	–	–	–	–	1	–
Sutherland	–	–	–	–	–	–	–	–	–	1	–

In addition, outbreaks were also recorded in August for the first time in the following counties: Cheshire, Cumberland, Durham, Glamorgan, Leicester, Lincs. (Holland), Monmouth (2), Montgomery (2), Northumberland (2), Stafford, Yorks (East Riding), Aberdeen (2), Angus (2), Dumfries, Fife (2), Kinross, Orkneys, Perth, and Stirling (2).

The Spread of the Disease ? While some local spread may have occurred by contact between individual rabbits, laboratory investigations do not suggest that this can have been a major factor. During the winter mosquitoes were unlikely to have been implicated, since the woodland species most likely to bite rabbits overwinter only as eggs or larvae. Attention was therefore concentrated on possible

ectoparasitic carriers. Since the relatively static Australian stickfast flea is known to be a carrier, it seemed probable that the common European rabbit flea, which is not present in Australia or New Zealand, might also transmit myxomatosis. Research in both the field and laboratory has shown that the European rabbit flea can be an effective carrier and, since fleas can survive on the bodies of dead rabbits for several days and still remain infective, they alone could account for the local spread of myxomatosis (although not for the uneven dispersal that has so far been characteristic of the disease in this country). Besides being found at fox earths, the bodies of diseased rabbits are frequently reported to have been attacked by carrion crows, magpies, gulls and buzzards. Predators and scavengers may thus have assisted in spreading the disease, possibly by transporting infective rabbit fleas from place to place. There seems to be little doubt, however, that the spread of the disease has been assisted and accelerated by diseased rabbits being taken from known myxomatosis areas to other parts of the country.

It was expected from Australian experience that in late spring or early summer mosquitoes and other flying carriers would play a large part in spreading myxomatosis and that the disease would become epizootic. Although this year cold weather delayed the emergence of adult mosquitoes, by May and June they were abundant in woods. But they were not biting rabbits. From March onwards, six tame rabbits were exposed to natural infection in woods near where the first outbreak of myxomatosis occurred in Kent. Each rabbit was kept in a hutch attached to a tree at about five feet from the ground, and one side of the hutch was covered only by one-inch-mesh wire netting. When the surrounding wild rabbits died from myxomatosis, the hutches were moved to fresh areas where the disease was still active: nevertheless, all six domestic rabbits remained perfectly healthy. Studies of mosquito-rabbit ecology carried out in this part of Kent confirm that mosquitoes, although abundant, have apparently not been feeding on wild rabbits.

In October 1953, some 200 acres were enclosed by rabbit-proof wire netting in an attempt to contain the initial outbreak near Edenbridge, Kent, and over 400 rabbits were killed in the fenced area. Although seven further separate outbreaks were reported before the end of the year, this attempt to restrict the spread of myxomatosis at its primary focus appeared to delay the spread there for a time.

The course of the disease in the Edenbridge area has been closely followed. In November, myxomatosis appeared at one farm close to the fenced area, but at no other until January 1954. By the end of February there were 16 further farms carrying infection, 30 more in March, and 17 in April, by which time myxomatosis was present in an area of about 21 square miles and at 65 locations. By the end of May, 5 additional infected localities were reported, and there were 51 more in June, 50 in July and 68 in August. This outbreak has now spread from its original 200 acres to an area of 187 square miles and has joined up with nearby independent outbreaks at Sevenoaks, Wateringbury and Matfield, Kent, and with that at Coleman's Hatch, East Sussex.

Although myxomatosis is widespread in this area, by no means all the warrens have been depopulated. As was the case in France in 1953, the spread of the disease is irregular. It has appeared on one part of an estate and moved gradually through some woods and fields, while others have been left untouched and have supported healthy rabbit populations for weeks and even months. This erratic spread is, of course, compatible with the

belief that the principal carriers so far have been ectoparasites and not flying carriers.

Work in the Ministry's laboratories at Weybridge and at Wye has confirmed earlier findings that while myxomatosis will pass from an infected to a healthy rabbit if both are kept in the same cage, the disease fails to pass from one cage to another. When fed on grass where myxomatous rabbits have previously been feeding, healthy rabbits do not contract the disease, and they seldom contract it even when given virus directly on their food. Experiments have not confirmed the French stories of virus being transported on motor car tyres. It would seem in fact that, in the absence of insect carriers, myxomatosis will spread readily from infected to healthy rabbits only when they are in close contact.

Vaccination of Domestic Rabbits Domestic rabbits may be protected against myxomatosis by inoculation with a closely related virus—the fibroma virus—which was discovered in the United States cottontail rabbit in 1932. Fibroma induces a benign disease in both American and European rabbits, causing only a local tumour and conferring several months protection against myxoma. Experiments at Weybridge have shown that vaccination gives a serviceable immunity in almost 90 per cent of cases. Up to the end of August, sufficient vaccine had been issued commercially for the treatment of some 40,000 rabbits. Research on other methods of vaccination is continuing, but meanwhile domestic rabbits should be dusted regularly with insecticides as a protection against the rabbit flea.

Myxomatosis in Australia The 1953-54 season in Australia began quietly and outbreaks were later in starting than in previous years. Little overwinter smouldering of the disease was reported in 1953, and the infection was believed to have died out over wide areas. Artificial inoculation was carried out extensively in Victoria and New South Wales, and is thought to have been very effective. As in 1950-51, high rabbit mortalities occurred mainly in the neighbourhood of rivers, swamps and irrigation systems. Mosquitoes have again been the principal carriers of myxomatosis and, probably because the dry winter and spring of 1953 delayed their development, disease activity went on into the autumn and early winter of 1954.

There is reliable evidence that field strains of the virus in Australia have become slightly attenuated and are now killing 90 per cent of affected rabbits, instead of the 99 per cent destroyed formerly. This reduced mortality could result in substantial populations of survivors being left to breed, but it is hoped to deal with them by the reintroduction of a highly virulent strain of myxoma.

Spread in Europe There is little news, as yet, of developments in France this year, but in Belgium, to which myxomatosis had spread by August 1953, there have been a number of outbreaks, mainly among domestic rabbits and mostly in western Flanders. Fibroma vaccine is now being used to protect tame rabbits. In Germany the disease was first observed in August 1953, at Mannheim, and although measures were taken to prevent its spread, it is now present over a large part of the North Rhine region. As in France, there have been a few cases of hares suffering from myxomatosis.

The virus also reached the Netherlands in August 1953, and there has been some infection of tame rabbits in every province but, at least initially, the

only wild rabbits to be affected have been on the German-Dutch border and in the province of Zeeland.

Introduction to Chile European rabbits have been present in the Chilean half of the island of Tierra del Fuego since about 1910, when small numbers were released from domestication at Puerto Porvenir. By 1930 they had become numerous and were spreading inland until, by 1947, they had reached plague numbers on two estancias leased by The Sociedad Explotadora de Tierra del Fuego, covering an area of over a million acres. Despite the use of gassing powders, poisons and traps, the rabbits continued to increase in numbers, doing such damage to the pasture that there were heavy losses of sheep through malnutrition and the stocking capacity was reduced.

In December 1953, rabbits on the estancias were inoculated with myxoma virus by officers of the Chilean Government, and between January and April 1954, additional rabbits were inoculated by the staff of the Sociedad Explotadora. Rabbits subsequently found in an advanced stage of the disease were also distributed about the farms. The disease was reported to be epizootic by February, and by March hundreds of thousands of dead rabbits were seen. There are said to be no mosquitoes in Tierra del Fuego and, so far, Chilean scientists have found neither fleas nor any other ecto-parasites on the hundreds of rabbits examined. The carriers of the disease remain unknown.

Outlook for Britain Last October it seemed possible that myxomatosis might die out during the winter, but it survived, and this year there has been considerable local spread from the original outbreaks. In the apparent absence of mosquito transmission, a very gradual extension over the country might have been expected, but the disease is now extensively seeded throughout most of England and Wales. There can be little doubt that it will again persist throughout the winter and will spread more widely next year. Although mosquitoes have so far played a very minor role in this country, they may well be important next year. It should be remembered that the epizootics in Australia vary from year to year, and that the governing factor appears to be the degree to which climatic conditions favour rabbit-biting mosquitoes. Moreover, the large number of outbreaks of myxomatosis among stocks of domestic rabbits in Europe suggests that flying carriers are active.

Virus isolated from wild rabbits in Britain shows as yet no signs of attenuation, and is at least as virulent as that first recovered from the field in Australia. Although pockets of susceptible rabbits are sometimes missed by myxomatosis in its irregular spread, very few immune rabbits have so far been found. In accordance with the recommendations of the Myxomatosis Advisory Committee, wherever outbreaks occur local drives will be organized, at the appropriate time, to eliminate rabbits that survive the disease. These "mopping-up" operations will be carried out by farmers and landowners in collaboration with County Agricultural Executive Committees.

In many areas where the rabbit population is drastically reduced, crops of all kinds will benefit. The flora of the less cultivated parts of the countryside will also be affected, and the Nature Conservancy are planning to study this aspect of developments in their Reserves. Foxes, stoats, badgers, buzzards, eagles and some hawks feed on rabbits, and changes in their habits and numbers are to be expected. Finally, as rabbits decrease in numbers, the hare, which is little affected by myxomatosis, may well increase.

IRRIGATION FOR SALAD AND OTHER INTENSIVE CROPPING

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Apart from the obvious use in combating drought, irrigation can be of great value in many other aspects of market gardening. But careful attention is necessary in regard to selection of crop, stage of growth, rate of application and type of equipment if the installation is to be economic.

WHEN we discuss irrigation it is frequently as part of a general story of growing, including emphasis on the limits of our climate and the merits of different layouts and types of equipment. Omitting these considerations, we are left to tell a very limited, though important, story of the purely practical application.

The technical justification for irrigation has now been made quite definite by the work of Dr. H. L. Penman of Rothamsted and Mr. L. P. Smith of the Meteorological Office. Until now, the grower's greatest use for it has been to overcome drought conditions which affect his cropping at some time in most seasons. Beyond this, we are satisfied we gain materially in weight and quality of crops, but it is difficult to provide evidence in terms of treated and untreated comparisons or of financial gain, which is so much a matter of market prices. It is true that irrigation may enable a grower to benefit from a market, but equally a poor crop can sometimes come in at a high price. However, it is not an infrequent experience in dry years to obtain increases which will in themselves cover the cost of installing irrigation equipment. For example, when we installed irrigation at Fernhurst in 1948 our income per acre increased by £120. It must be realized, however, that in this instance other factors, such as greater use of fertilizers and general improved fertility, accounted for part of the increase. Nevertheless, I look upon a satisfactory water supply and irrigation equipment as an essential part of intensive market gardening in south-eastern England, even under such a high average rainfall at Fernhurst of 35 inches.

Use on Early Crops and in Cultivations In market gardening we can average about one-and-a-half crops a year from the land, ranging from perennial use to individual plots carrying three, or, with a succession of radish, even as many as six crops, where very favourable conditions exist. Let us consider a season's cropping and the programme for irrigation, leaving out for the present special uses not typical of, or essential to, the maximum growth of the crop.

We come first to late spring greens, spring cabbage and overwintered spinach as crops occasionally benefiting from irrigation as early as April. Some growers irrigate their rhubarb to increase rate of growth and weight of April-May pullings. No doubt, part of the benefit from these early waterings is in making fertilizer dressings available to the crops. Dry spells in spring can often frustrate the timing of nitrogen dressings. Most frequently, the first crop really to benefit is overwintered, early-planted cauliflower, particularly where the grower is able to use the Early Erfurt, Pioneer and Early London types. In my opinion, irrigation is essential for this crop, particularly in the lower rainfall areas of the country. All-the-year-round varieties undoubtedly benefit as well, but will generally succeed under less favourable conditions. Overwintered lettuce occasionally gains

in a similar respect to spring cabbage, but more frequently the types that will benefit the most are the early, spring-planted round and cos varieties of lettuce and the early summer cabbage of the Primo type.

Time of application and stage of crop are important for both growth and practical reasons. From the beginning of June the whole range of crops may benefit, according to their type and season. We come, however, to the more complicated time when early crops are being cleared and land cultivated for recropping. The soil, depleted of most of its moisture by early crops (frequently as a result of the rapid cultivations required), becomes dried to a degree that the success of sowings or plantings is entirely dependent on the occurrence of sufficient rain. To achieve intensive cropping, little time can be lost waiting for favourable conditions; we must be able to clear crops quickly and recultivate within a few days. In fact, we often attempt to finish a crop one day and redrill or plant the following day. The use of irrigation in enabling recropping during dry periods is one of its most important uses and generally the one which brings the most spectacular benefits.

Summer Irrigation Irrigation in July, August and September does not follow any predictable pattern, except for special crops. Summer and early autumn crops, like the earlier spring and summer ones, need to grow quickly, and sufficient irrigation to ensure this is always desirable. With crops which are to grow and mature in winter, such as cabbage, savoy, late cauliflower, broccoli, and sprouts, irrigation beyond the amount required for establishment can result in their growing out of character—cabbage can be too leafy and large, sprouts slow to button, cauliflower and broccoli too soft to produce good quality curds. Root crops, in particular long beet, grow too large and are seriously reduced in value by late irrigation. There is always the risk of this where irrigation is applied later than the immediate post-singling period, particularly if the crop has a tendency to be thin. The exceptions which can be relied upon to benefit from July-August irrigation are self-blanching celery, cauliflower of the Pioneer type, and early-flowering chrysanthemums such as the Sweetheart varieties.

Special Uses for Irrigation Mention must be made of the special uses of irrigation apart from supplying moisture for growth. The first and most frequent application is to make harvesting easier. Prolonged dry conditions can make the pulling of carrots and Lisbon onions almost economically impossible. Watering the market requirement for two or three days ahead reduces labour greatly and improves the sample. In a similar way, irrigation can help in the cultivation of land, both in the preparation for a crop and when baking conditions have made inter-crop cultivation very difficult. Some skilled growers may argue that if one's land is in good heart and cultivations have been timely and properly carried out, such aid should be unnecessary. However, we can seldom achieve the ideal all the time.

Irrigation can also provide protection from frost damage. In my experience, equipment placed for young marrows, early-planted tomatoes and chrysanthemums has turned the scale on those May mornings when for very short periods damaging frosts occur. At the other extreme, damage from excessive heat in Dutch lights and cloches can be prevented where irrigation can be turned on overhead between midday and mid-afternoon. April and early May can be treacherous for lettuce reaching maturity, particularly in single-span Dutch light ranges and cloches laid out east to west.

Pest and disease control, too, can be assisted materially by irrigation. I particularly have in mind aphids on cos and, to a less extent, on round lettuce. In hot, dry conditions a good watering when the crops are three-parts grown will help to maintain quick growth and, in some circumstances, materially reduce the numbers of aphids. Similarly, the irrigation of round lettuce, particularly in Dutch light structures and houses, reduces damage from *Botrytis*.

Contrary to tradition, we now practise hose-watering and liquid feeding of May Queen lettuce in Dutch lights with benefit to individual size and weight. The use of irrigation for feeding field crops should, in my opinion, be looked upon as an aid under favourable conditions, and only then to replace side dressings, using application rates sufficient to provide the equivalent amount of fertilizer. In other words, to irrigate when the soil is wet, simply as a means of applying fertilizer, may do more harm than good.

When to Irrigate Until now, the decision when to use irrigation has been by observation, experience and intuition—a combination of knowledge comparable with the green-fingered art of the gardener. Excluding special uses, for which the conditions are, or should be, more obvious to the grower, our general criterion has been the close observation of crops and soil condition against the background of the season's rainfall, length of time without substantial rain, and the stage of the crop. In most circumstances an observant grower will decide when it is time to begin by the appearance and feel of his soil and how freely it breaks after compressing. Failing this, crops show a change easily perceptible when working amongst them—a slight deepening of colour and shrinkage, characteristic of moisture shortage. The occasional flagging of crops under strong sun following dull periods should not, of course, be confused with real water shortage in the soil.

In 1952, as an aid to irrigation, we kept a graph of the rainfall deficit at Fernhurst, using our rainfall and sunshine records in conjunction with the Meteorological Office tables for average potential transpiration, weighting factor x, mean sunshine hours, and the equation published in the N.I.A.E. booklet *Green Crop Water Requirements for Optimum Growth*. On our graph we also allowed for an additional $\frac{1}{2}$ inch loss per month to take into account the water held in the soil from the beginning of the season.

To compare with our practice on the market garden, we were watering cauliflower about a fortnight before the graph reached an inch below the planned deficit, that is approximately one-and-a-half inches below field capacity.

For intensive market gardening it is clear that every piece of land would require its own calculations and that considerable planning and guesswork would be required, particularly for the variation in crop cover and effect of cultivation. I emphasize planning, which is very important however irrigation is used, but to wait for a predetermined figure incurs having to water a bigger acreage all at one time, and some practical compromise is needed. In 1953 we took less consideration of the water available in the soil, irrigating when our graph showed a deficit of 1 inch below field capacity, applying $\frac{1}{2}$ inch of water and increasing this to 1 inch as the deficit increased to $1\frac{1}{2}$ inches. This change widens the period for irrigation and keeps the soil moisture in the more desirable low tensions for rapid growth. It is likely, however, to increase the frequency of irrigation in years with long, dry periods.

Need for irrigation when recropping is also a matter of experience of the soil and assessing it by appearance and feel. Such knowledge, of course, can help greatly in deciding whether a chance can be taken in sowing or planting without irrigation. The need is also affected by the depth of soil which is dry and the rooting characteristics of the crop. For example, transplanted cauliflower is, in practice, often the most urgently in need of irrigation among the crops planted at about the same time in the spring. In fact, any transplanted annual crop is more affected by drought than are drilled crops with an undisturbed root system. Singling early, by allowing good development of the plant, also improves its ability to stand difficult conditions.

How Much Water? When deciding to irrigate it is necessary to estimate how much water should be applied and to avoid overwatering by limiting the amount applied to sufficient to reduce the estimated deficit to ½ inch. This allowance takes care of the possibility of heavy rain following irrigation, producing unfavourable, waterlogged conditions, and so retarding a crop. In the past to economize in water and time and to avoid overwatering I have always found it worth while to use the purely arbitrary basis of applying 1 inch of water (approximately 22,000 gallons per acre) to moisten the top 12 inches of soil, or ½ inch where the top 6 inches only are dry and the crop is shallow-rooted. It is seldom worth applying less than ¼ inch of water, and when hot, drying conditions exist, ½ inch is about the minimum useful distribution.

Exceptions to the above are the special crops, such as self-blanching celery, where irrigation can be applied with benefit every evening during dry spells for short periods of, say, half-an-hour, by the use of spray lines. This produces the maximum growth and certainly the most eatable celery. With early chrysanthemums, where long stems, good foliage and bold flowers are required, abundant moisture and atmospheric humidity are essential.

Considering the actual application, it will be seen from the different uses discussed that irrigation on general crops or pieces of land will be needed on only one or two occasions during the season. Our average application at Fernhurst is 1.7 inches per year. Under very intensive cropping, such as successions of radish or lettuce, we may increase it. Generally, however, equipment can be moved around, and I have found that adequate equipment to water one acre in every twenty to twenty-five at any one time is sufficient. With special crops requiring moist, humid conditions, or where provision is needed for preventing frost or scorching under lights or cloches, permanent arrangements must be made or equipment set aside, apart from general requirements.

Recropping and Time of Application I have pointed to the time for recropping in June and July as being perhaps the most important from the point of view of irrigation. The greater the irrigation requirement, the more difficult is the organization problem to keep pace with recropping needs. It is also a time when careful consideration should be given to application. How often does one see a scamper to irrigate a piece of ground when it is found to be too dry to drill or plant, and then have the drill or workers poaching the ground shortly afterwards. It is almost equally bad to have to irrigate soon after sowing, leaving all but the most open soils soaked down on the surface to dry in a hard, unkind crust.

Where irrigation can be applied usefully to a maturing crop, it has the advantage, if the crop is cleared quickly, of providing sufficient moisture readily available for the early growth of the new crop.

Time of application of irrigation is important. Spring crops usually start off with ample moisture. For summer crops to make quick and tender growth, adequate moisture must be ensured either before sowing or planting or as soon as the seedlings or plants are established. In the case of seedlings, this is a week or so after thinning, when the rubbish has had time to die. With crops requiring water before maturity, a stage about three-parts mature is often best; for example, when cos lettuce is about to turn in and when cauliflower is about to develop its curd. This stage has the important practical advantage of giving time for the surface to dry out before workers tread about; working on wet land can spoil a lot of the crop, particularly one such as round lettuce.

When irrigation is needed we seldom have choice of conditions. Obviously application is least efficient when it is windy, and losses result from evaporation when watering is carried out under very hot conditions. Where practicable, there is much to be said for irrigating during the night or in the early morning and evening. Light, summer rains should not deter the grower from irrigating when the soil is dry. Even during wet spells in the summer of 1953 experienced bone dry conditions just under the surface of the soil.

Heating and aeration of irrigation water have been suggested as being helpful. I have little faith in either. The little heat one might apply would be dissipated very quickly and the benefit compared with glasshouse crops where it is usual to use water direct from mains, outside reservoirs or streams, is not noticeable. Aeration of water supplies has been said to reduce scorching of crops and to be beneficial, but again I cannot recall seeing any scorch which could be attributed to overhead spraying in the open, and I should be surprised if aerated water maintained an improved oxygen status after being reduced in pressure and broken up into droplets when discharged through irrigator nozzles.

Choice of Equipment I have purposely avoided much mention of equipment; choice of types will certainly be dictated by soil, crops and labour. We chose for our main irrigation at Fernhurst conventional eight-nozzle, 16-foot spray lines supplied through portable lateral mains from an underground trunk main running centrally through the length of our irrigation area. Our object was to get an application rate of 1 inch in approximately six hours, and the water droplet size suited our rather heavy soil which, due to its high silt and fine sand content, runs together and cakes on the surface. The rectangular application also fits in easily with field and cropping arrangements, and I would say here that we preferred the arrangement where spray lines run parallel to crop rows. However, there are some arguments in favour of lines at right angles.

Large rotary rainers have, in our conditions, too high a rate of application for use other than on crops which provide a foliage cover, or for grassland work, where we have found them quite satisfactory. If we were starting afresh we would now consider carefully the merits of the small rotary ejector-type sprinkler which fits into light aluminium mains; we have found they function very satisfactorily on small permanent layouts and their advantages in ease of handling offer opportunities for cheaper and more intensive use.

Organization and Costs At this stage we come to the main problem of the grower—getting irrigation work done properly at a reasonable cost and minimum disturbance of labour from cropping and harvesting. I cannot emphasize too strongly the importance of making irrigation the responsibility of an intelligent man and encouraging observation and care in application, and in use and maintenance of equipment. We advocate frequent observation, careful setting of the lines to suit wind direction, use of a fork to test how even a penetration has been obtained, and great care in handling all parts of the system. We all know how expensive in time and mess swampy patches due to leaky connections can be.

Our experience with oscillators has been disappointing. We can obtain much more even distribution and spend less time in adjusting with hand setting; the strain on joints and frequency of leaks is markedly more with oscillators we have used. We have now found it an advantage to use more lines per acre at a 30-foot spacing to achieve even watering and fit in conveniently with our bed system of cropping. This gives us an application rate of 1 inch in 3½ hours.

To give an idea of cost, our figures for a 50-acre market garden are approximately as follows:

Capital Cost	*Per acre* £ *s.* *d.*	*Depreciation per year* £ *s.* *d.*
Water supply to reservoir (stream collecting chamber, pumps and main)	12 0 0	1 4 7
Reservoir	13 0 0	10 2
Static main feed from reservoir pumps	44 0 0	4 7 10
Portable mains and spray lines	21 0 0	2 1 4
	90 0 0	8 3 11
Annual Cost (1953)		
Manual labour	14 5	
Tractor labour	3 3	
Repairs and renewals	3 5	
Electricity (estimated)	13 2	
Water cost (at 1.7 inches per acre)	1 1 0	2 15 3
TOTAL COST PER ACRE		10 19 2

The comparative figures for 1952 and 1953 in manual and tractor labour costs are:

	1952 £ *s.* *d.*	1953 £ *s.* *d.*
Manual labour	1 6 11	14 5
Tractor labour	2 9	3 3
	1 9 8	17 8

This saving of 12s. per acre in 1953 resulted from the use of the bed system and the more effective part played by the tractor.

The use of aluminium for spray lines and portable mains is another way of reducing labour, particularly where a lot of moving is required without the help of a carrier. Our experience so far has not indicated greater wear and tear, probably because the workers can handle the lines more easily. Most damage comes from strain or rough handling in moving equipment. One is often tempted to employ quick means, such as using a gang of workers to pick up a whole line, but it often causes more damage than the saving in time is worth.

We estimate that it takes 3¼-3¾ hours for two people to dismantle, transport, set out and re-erect, an acre of spray line at a normal working rate. Large rotary rainers certainly reduce the time spent in moving equipment. A well-known grower, whose soil allows him to use these, estimates his saving, compared with spray lines, as 50 per cent. The new type of light mains with automatic couplings and small rotary ejector-type sprinklers on short standpipes every 40 feet would, according to individual observed cases, reduce the time by more than 90 per cent.

SUFFOLK MARSH RECLAMATION POLICY

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By next summer hundreds of acres of the Suffolk marshes, which were inundated in the sea floods of February 1953, will be ready for cultivation. This is the opportunity, suggests Mr. Trist, to introduce a new management policy designed to tap the hitherto wasted potential of this area.

THE results of spring soil sampling on the Suffolk marshes showed that on thousands of acres of grass marshes which were under salt water for over three weeks in February 1953, the salt content had fallen very considerably, compared with the figures obtained in the March 1953 sampling. In spite of slight increases which have occurred this summer, the time of reclamation is at least in sight. Provided that every precaution is taken to avoid water standing on the land, there is no reason why the salt level on a large acreage should not fall below 0.1 per cent by the early summer of 1955, and at this level it should be quite safe to go ahead with thorough cultivations preparatory to reseeding.

The question of method of cultivations will be dictated by a variety of factors, such as soil type, the composition of the sward which has tolerated the salt conditions, drainage and the nature of the levels on the marsh. But before considering method, it is of greater importance to work out an entirely new management policy for these areas—for if these marshes are roughly renovated, they will soon revert to pre-flood condition, and if reseeded without due regard to conditions which are essential to the growth of any crop, then much time and money will be wasted.

Change of Attitude Needed The pre-flood condition of the grass marshes must now be regarded as the management of yesterday, and the first essential in a change of policy for the marshes is a change of attitude. With little doubt, the seaboard marshes from Southwold to the mouth of the River Deben have the greatest potential of production of any land in Suffolk. In the past four years, this has been proved by a number of wheat crops which have yielded 10-12 qr. per acre and by a limited area of sugar beet which yielded 19-21 tons. Several hundred acres between the Rivers Ore and Deben lie on the "stetch" as they were formerly ploughed, probably between the years 1870 and 1890, bearing witness to the wisdom of our grandfathers. Many areas along the Suffolk coast only

experience 18-20 inches of rain per year, and the low-lying marsh has come to be regarded as an evergreen source of feed, regardless of its quality; whilst the presence of the light upland, coupled with a lack of interest for grass cultivation, has perpetuated an excuse for the upland to be kept under arable cultivation and for the marsh levels to remain an interminable derelict crop of marsh flora.

Can this policy continue to be excused and can modern advances in husbandry, coupled with the recognition of soil potentials, come to the rescue of an antiquated system of waste? The sugar beet crop is of first importance to the whole of the economic system of Suffolk farming; and if the same care, attention and continued acquired skill which is directed towards beet was given to grass and lucerne, the long-term effects might well prove even more profitable. Within the light land eastern belt, the paramount crop is lucerne and its companions. On progressive farms this is already demonstrated where sandy upland has been put down to lucerne and its mixtures, whilst a far greater area of marsh grass has been brought under the plough, with the result that it is able to feed still more livestock. The reason for retaining all of these marshes in grass is therefore destroyed, and the acreage retained per head of cattle is indefensible. The acceptance of half-filled ditches and waterlogged conditions with acres of rushes is not husbandry: and the payment of rent for unprofitable returns is no criterion for success.

There are many hundreds of acres which are let annually at "sales" of marsh grazings. Of all the pernicious systems, this is the very worst. Grazing is generally let to the highest bidder for the period May-October, during which time there is no obligation on the tenant to apply lime, fertilizers or any form of cultivations, and under such a letting the landlord has no remedy at law. The tenant recognizing this fact and that his bidding for the same area may not be successful in the following year, has no incentive but to "take all". Therefore, as a system of utilizing grassland, it abounds with all the evils of *laissez-faire*, which has no merits in modern husbandry and completely discounts the possibilities of land which is capable of far greater production.

I have already referred to the necessity for a change in attitude, but this comment is not only applicable to occupiers of the marshes. And having criticized the failure of those who have not begun to realize the real value of the marshes, it is only fair to add that these and others who have tried the plough have, until 1953, lived in constant fear of inadequate sea defence, recognizing the inability of river and sea-wall sluices to cope efficiently with the discharge of water. Without knowledge of engineering, it must be obvious that the volume of water reaching the marshes on its way to the sea has, on account of fifteen years of concentrated work on farm drainage, caused a burden which the sluices were not originally designed to bear. In consequence, the level of water in the ditches is far too high during the winter months, and in many instances so high that water furrows are receiving ditch water, instead of being able to discharge into the ditch. No arable crop can yield its maximum under such conditions, neither can grass continue to survive, unless we revert to the contentment of *agrostis*. If because of the ever-present threat of water we cannot achieve the possibilities of which the soil is capable with a sluice system, then the only answer is a quicker discharge by pumping. It is realized that pumping stations will be costly, but there is little doubt that the contributions which may have to be borne by occupiers would easily be offset by the increased yields which the marsh is capable of producing. It is true that there are soil variations in our

Suffolk marshes and that some areas are better than others, but some have had a rest from the plough for at least seventy years, whilst thousands of acres have never yet been ploughed. Surely a store of fertility lies below?

Let us be optimistic and assume the possibility of pumping on all the levels in the near future, which will help us change our attitude towards the condition of marsh grasslands, and turn to face the fact that a very large percentage of the flooded marshes are now wrecked. We then find that there is no other alternative but to work out a new policy for the marshes and get down to putting these areas to the test. If this can be achieved, at least a second good thing will come out of this disaster—the first being the new condition of our sea defences.

Cultivation of the Arable Marshes . . . What are the differences in the conditions which prevail throughout the area? There are, on the one hand, the marshes which have been broken up in the past five years, and, on the other, the grasslands. The latter fall roughly into two kinds: those which are comparatively free of twitch, having been under the plough some 50-80 years ago, or perhaps not previously ploughed but which lie level with a comparative absence of depressions; and those, badly infested with twitch, which have never been ploughed and are full of depressions, almost representing a dried-out salting surface. How should these varying types of marshes be reclaimed from the condition in which they were left by the floods?

Practically all the arable marshes have a clay loam soil overlying a heavy clay. Most of them were deep ploughed before the flood and many were subjected to a prolonged flood of three weeks and more. The water penetrated deeply, and therefore the greatest accumulation of salt was low down. In the spring of this year the salt in the upper levels was reduced considerably, and more than double the acreage planted in 1953 has been drilled in 1954. Provided that cultivations are shallow, the risk of a rise in the salt during the hot weather is small.

Should we plant barley or grass? This depends on requirements. If a farmer is in a bad way for grazing, a ryegrass ley may be a better proposition than half a crop of barley. Grass only needs an inch of tilth, and the lightest of cultivations is ideal under these conditions; in addition, ryegrass is more tolerant to both salt and a change in soil conditions. Although some soils can produce a fair crop of barley with a salt content of 0.2 per cent, the clays will not: and it is not only the presence of salt, but the condition of the soil which affects the barley yield. Looking at the situation broadly, the best policy seems to be to lay down the arable to grass and to break up a proportion of the wrecked grass and put it through a rotation. What is the reasoning? The salt in the upper levels of the grassland is, by comparison, higher than in the upper levels of the open arable: and the grassland will require more attention by deeper cultivation, so that it will be wiser to leave it for another year and make a success of the job.

Some arable marshes were lightly disced to keep down weeds last year, but others were not; and those who left them unattended made no mistake. The salt-tolerant flora which have reappeared again this year are annual plants and will later be bunches of dead sticks, so that their destruction will be simple. Where there is an abundance of the common orache—the multiple-branched plant roughly circular in growth—and the shore orache —which is erect and may be mistaken for fat-hen—a light discing will level out their skeletons. Gypsum can then be applied and worked in with a

sharp-pointed, straight-toothed harrow. The operations should only be carried out when the land is absolutely dry, and should be followed by rolling to form a consolidated seedbed ready for grass seeds.

. . . and the Grass Marshes Now let us turn to the grass marshes. Where the marsh is reasonably level and free from depressions which will hold water, with a safe salt level and free from twitch, direct reseeding can be attempted—but only if conditions are good and remain good while cultivations are being done. To avoid the possibility of salt rising from the lower levels, the rotary cultivator, which can be set to depth as desired, is preferable to the plough, which is difficult to keep in the marsh unless 5-6 inches are turned, and has the added disadvantage that the sole of the plough causes "smearing" of the clay. In addition, the action of the rotary cultivator is to slice up the matted, fibrous material of the old sward so that it can be incorporated into the upper layers of the soil, as opposed to being buried to the depth of ploughing. The fibrous matter retained near the top surface is also a greater asset for surface drainage than is upturned clay which has not been previously exposed to weathering. A ploughed grass furrow on the marsh, unless ploughed down deeply, is not successfully buried, and much of the old sward of Yorkshire fog, barley grass and bents (which have not only survived but multiplied since the flood) will continue to grow. This will necessitate more cultivations—which are undesirable. The number of rotary cultivations needed will depend on conditions. The disc will also be required to assist the breaking down of the matt. Where a sward can really be ploughed down out of sight, one of the problems of marsh reseeding is overcome, but under salt conditions we cannot do this, and within the shallower depth of cultivation the dead fibrous matt must be effectively cut up, or surface consolidation for grass seed germination will be difficult.

Another problem in consolidation is the granular condition of the soil found on some marshes. Where this prevails, the first inch of tilth is very loose and dry and the drill counters should be below this level. If much fibrous material is also present, a large percentage of seeds will chit and die.

The other type—the uneven and unploughed grassland—presents many problems, and in spite of considerable reductions in the salt level, these marshes will require a lot of work if they are to be reclaimed as they should be. Therefore, since cultivations of a more drastic nature will be called for, it will be safer to delay operations on them until the summer of 1955, or later, as conditions and the pocket dictate.

These marsh levels have lain in an agony of neglect for generations, for a number of reasons. Their general level is such that, until some alteration is made, it will be quite out of the question for a system of good grassland management to be adopted, let alone a possibility of cropping with other than grass. Some of these areas have wide "fleets", which meander tortuously and are, in fact, the remains of old river-beds. Their course can be adjusted by straightening here and there and their banks should be fenced on both sides to prevent cattle from treading down the sides and increasing their width.

Elsewhere on the marsh, the level is undulating with depressions, which are inevitably full of water for many months of the winter. We have therefore a water problem, and a level which, as it stands, cannot be successfully cultivated. The first work then, after dealing with the "fleets", is the introduction of a bulldozer for levelling.

It is inevitable that some soil is going to be in the wrong place, more especially raw clay on the surface, and these areas will remain wet and lack consolidation for a year or two, but the operation will prevent standing water once the soil has settled, and will create a level which can be properly cultivated and a condition in which crops can thrive. Once levelling is completed, the rotary cultivator should be set to break up the surface matt and gradually let in to incorporate the rotting grass roots throughout the depth of the cultivation.

The Problem of Twitch On these marshes there is yet another problem—the presence of twitch. The bent family, barley grass and Yorkshire fog present no difficulty in cultivations, but the destruction of twitch is quite another matter, on account of its stoloniferous roots. The continued use of the rotary cultivator will multiply the root system by its cutting action, and it is equally undesirable to bury the twitch in a fallow tilth, which would encourage it to shoot. Therefore, where there is an abundance of twitch in a marsh initially broken up by a rotary cultivator, it is preferable to complete its eradication by fleet ploughing and the use of a harrow of the long-spiked type. The ploughing should not be deeper than the maximum to which the rotary cultivator has been let in, and even if the plough jumps out or appears to be doing a rough job, it matters little as long as the twitch can be either locked in a clod or left on the surface to wither.

The new walls are raised and the ditches are dug. When salt levels are safe, this appears to be the programme to follow on hundreds of acres of Suffolk marshes which, in pre-flood days, required 2-3 acres of grass per beast. This is not farming. The land is capable of supporting a beast per acre or producing 10 quarters of wheat per acre.

MYXOMATOSIS

Disposal of Carcasses

The Ministry of Agriculture and Fisheries and the Department of Agriculture for Scotland have appealed for the assistance of people in rural areas in clearing away the carcasses of rabbits that have died from myxomatosis.

They point out that in the interests of rural hygiene, and for other reasons, it is desirable that carcasses of rabbits that have died of the disease should be buried or disposed of in some other way. Farmers, landowners and farm workers should take note of this advice in regard to bodies of rabbits that are found on private property. It is also hoped that local authorities in areas where rabbits are dying of the disease will make arrangements for the disposal of carcasses on highways and land to which the public has access.

The Agricultural Departments, National Farmers' Union, Country Landowners' Association and Agricultural Workers' Unions are in full sympathy with action that is being taken by farmers and others, and by the organizations concerned with animal welfare, to put a quick and painless end to diseased rabbits.

THE TENTH WORLD'S POULTRY CONGRESS

R. COLES, B.A., Ph.D., M.Sc.(Agric.), M.Sc.(Econ.)

The Tenth World's Poultry Congress was held this year for the first time in Scotland from August 13 to 21. Dr. Coles, who was elected President of the World's Poultry Science Association during the course of the Congress, here gives some of his impressions of the highlights of the proceedings.

THE proposal made at the last Congress, held in Paris in 1951, to hold the Tenth World's Poultry Congress in Edinburgh was received with great enthusiasm. It transpired that to many Europeans, and not a few Americans, Scotland was a land of romance and pageantry. Many had heard of unusual gastronomic combinations prevalent in that country, and of these one at least was shrouded in mystery—it being uncertain whether haggis was a bird, a beast or purely a myth. A few understood there were characteristic departures from the norm in Scottish dress.

None of the 2,000 visitors from 67 countries was disappointed in their reception. True, some of their doubts were resolved and others deepened. But the long-anticipated traditional pageantry of Scotland fulfilled all expectations. Some outstanding papers were presented and will long be remembered by many; but none will forget the Military Tattoo at night under the loom of Edinburgh Castle, and the dwindling drone of the pipes as the rhythmic flicker of the Highlanders' spats faded and the melody of "Will ye no come back agin" died away. In lighter vein, but "to be remembered with advantage" on more dignified occasions, was the Scottish Evening, with many eminent and learned poultry scientists in full Highland fig performing their aboriginal dances and slightly scaring the Sassenach with occasional screams of delight or pain—it was uncertain which.

But the primary purpose of the Congress was the interchange of knowledge on poultry matters. The organization provided by the Congress authorities for the presentation of the 114 papers from 24 countries was excellent, as indeed it was for all Congress arrangements. There was a novel departure from custom in the opening plenary session. In place of the usual five papers dealing with some one aspect of genetics, nutrition, disease, marketing, and husbandry, respectively, three papers only were presented, covering the major developments in the fields of breeding, nutrition and disease since the last Congress in 1951.

Trends in Breeding The first paper, by Professor I. Lerner of the U.S.A., was so packed with material that in this account only reference to the major conclusions is possible. Of chief interest was the manner in which Professor Lerner dealt with those trends which have developed recently in poultry breeding and which are still regarded with doubt by many breeders. In the speaker's opinion, there has been a retreat from the view that there can be one single breeding system applicable to any or all traits under improvement. He emphasized the need for flexibility in the breeders' attempts to secure improvement and, possibly to the surprise of many practical poultrymen, referred to the market report as the final arbiter of success.

In describing recent trends, Professor Lerner also referred to the increasing size of breeding establishments, which seemed an essential prerequisite of any such centre employing scientific knowledge. And he drew attention to the widening gap between the functions of such undertakings and those who

actually produced and distributed commercial chicks. This divergence was certainly becoming firmly established in the U.S.A.; it has, of course, been recognized in this country by the establishment of the Approved Section in the P.S.I.P.

It was characteristic of Lerner, with his deep fundamental knowledge and humanity, that his last words were to the effect that professional geneticists should not forget that their complex mathematical expressions had biological meaning based on the life-cycle of the living individual.

Nutritional Developments In presenting the second principal paper, Dr. T. H. Jukes of the U.S.A. dealt mainly with advances in our knowledge of antibiotics, vitamins and amino-acids since 1951. Discussing his subject, Dr. Jukes emphasized its increasing importance in an industry in which economic conditions were fast promoting the widespread use of intensive rearing methods. The speaker reviewed recent work on antibiotics in stimulating growth and stressed the limited knowledge of the effects of nutrition produced by the myriad bacteria of the digestive tract. On the controversial subject of the manner in which antibiotics secure their observed effect, Dr. Jukes considered it still unsafe to attempt to define the precise method by which the improvement was achieved.

He then referred to the claims that antibiotics may improve egg production. After reviewing the experimental evidence, Dr. Jukes concluded that mild diseases may depress egg production, and that this depression may *in some instances* be reversed by the antibacterial action of the antibiotic.

Probably the most interesting statements by Jukes were those about encephalomalacia (crazy chick disease). He referred to the relationship between vitamin E and the disease, and to recent findings that certain antioxidants share the properties of vitamin E in preventing its incidence.

Low levels of vitamin E did not affect egg production or adult mortality, but the progeny of such stock with depleted reserves of the vitamin showed a high incidence of encephalomalacia when fed a diet containing 2 per cent fish oil. The success of antioxidants in protecting such chicks against the disease was one of the most interesting recent developments and may solve the twofold problem of protecting both vitamins A and E from oxidation by air.

Increasing Knowledge of Disease The final paper at the plenary session was presented by Mr. J. E. Wilson of Scotland, and dealt with the developments in our knowledge of poultry diseases. Throughout his paper Mr. Wilson emphasized the heavy financial losses occasioned by disease, and he gave point to his remarks by reference to actual figures running into millions of pounds each year. The relative economic importance of the major diseases formed the basis for Mr. Wilson's approach to his subject. Foremost in his list was the leukosis complex, and Mr. Wilson gave an account of the recent findings of research workers which pointed to both the need to regard the various forms of leukosis as separate disease entities and to consider them as having different causal agents with differing modes of transmission. In spite of the great amount of work carried out by many workers, much still remained to be discovered, and Mr. Wilson concluded by stating that breeding for resistance and rearing in isolation were still the only means of combating the disease.

Both Newcastle disease and C.R.D. were discussed by Mr. Wilson, with special reference to vaccination in the case of the former. Of particular

interest was his reference to work in Japan on pullet disease, which indicated that a filterable virus was involved. Mr. Wilson concluded his useful and interesting survey on a note of both warning and praise; warning against regarding medicaments as an essential component of the bird's diet and using them to replace good husbandry; and praise for the unpublicized, but essential, labours of the diagnostician.

Genetics In the sectional sessions there were a number of advanced papers on fundamental matters, which, although excellent, not unexpectedly had only a limited appeal to many of the practical poultrymen present. And the Congress membership did not have by any means a preponderance of pure scientists. It was therefore natural that those papers dealing with subjects of topical interest to poultrymen secured most attention from the majority of delegates, although a high attendance at all sessions was a characteristic of the Congress.

In the sessions concerned with genetics, much interest centred on the papers dealing with hybrid vigour and—certainly so far as the United Kingdom was concerned—with the testing of breeding stock. Professor Jaap of the U.S.A. and his colleagues presented a paper supporting their conclusions that, on the basis of egg production, in-cross-breds ("hybrids") surpassed cross-breds, and that the latter surpassed pure-bred birds. But they suggest that the superiority of the hybrid over the cross-bred may be attributed to progeny-testing of crosses between inbred lines, rather than to any inherent superiority of the so-called "hybrid" system of mating. They also pointed out that mortality was slightly higher with the in-cross-bred than with either the pure-bred or cross-bred lines. Rather in agreement was a paper on the same general subject by Pease and Dudley of England. In comparing in-crosses with out-crossed pullets, they found the former inferior in both body and egg weight. But in egg production many of the in-crosses proved superior, although marked variations occurred. The authors concluded that no method by which the performance of an in-cross could be predicted was apparent.

Dealing with random sample testing, S. C. King of the U.S.A. described such a test carried out in New York State. The test is based on the performance of chicks drawn at random, and all samples are reared together without isolation. The most interesting aspect was Professor King's conclusions on the accuracy of the results. He argued that if only one sample were possible in one pen, successive yearly entries did not add to the accuracy as a guide to the quality of the stock. He also discussed the repeatability of the samples for numerous traits of economic importance over three years. Some marked variations were manifest, and Professor King considered the repeatability if all entries were mixed during rearing, instead of being isolated in separate pens.

The Nutrition Section The contributions to the Nutrition section ranged widely over the subject, and the absence of a mass of papers on antibiotics and vitamin B_{12} made a welcome change. If a main theme could be detected, it was the ability of the hen to assimilate various foodstuffs. In this connection, a paper by Dr. W. Bolton of Scotland was of interest. This contribution dealt with the digestibility of the carbohydrate complex of bran and oats by adult cocks. Dr. Bolton argued that "available carbohydrate" was the most useful criterion for the assessment of poultry foods, using the term to cover starch, dextrin and the di- and mono-saccharides expressed as starch. At present, carbohydrates are divided into crude fibre

and nitrogen-free extracts, with the implication that the former is not, and the latter is, digestible by the bird. Dr. Bolton showed that this was not so and that the evaluation put forward—that followed for human foods by the M.R.C.—was more realistic.

Dr. K. J. Carpenter, also of Scotland, in a paper on protein supplements made the interesting point that in United Kingdom rations with typical cereal mixtures the total percentage of crude protein could be considerably less than the 15 per cent recommended by the U.S.A. This, he argued, was due to the lower energy content of the U.K. ration, and in consequence birds have to consume a greater amount, compared with the U.S.A. ration for which the 15 per cent figure was designed.

Some interesting observations were made by J. Adrian of France on the behaviour of the hen towards excessive doses of certain B vitamins. He concluded that the transference of the several vitamins to the egg varies and that the hen exercises selective action.

Interest in Leukosis In the sessions devoted to disease it was not surprising to find leukosis the subject of a number of papers. Among the main points of interest were those of F. B. Hutt of the U.S.A., who urged breeding for resistance; the plea by J. G. Campbell of Scotland for a better appreciation of the classification of the several forms of the disease; and the findings of N. F. Waters of the U.S.A. that hybrid vigour did not decrease mortality from lymphomatosis. It was particularly apparent that the scientific workers present felt that much remained to be discovered with this disease, and the claims advanced were, for the most part, very cautious. One paper of special interest was that by Mary Juhn of the U.S.A., in which she described feather pigmentation changes in birds suffering from lymphomatosis.

Several papers on vaccination against fowl pest were presented, and a number of members had contributions to make on respiratory diseases—both subjects indicative of the major disease problems now facing poultry-keepers.

Some Other Subjects The papers on economics and marketing were a little disappointing in number and content. Several of the papers in this section, and in the last section dealing with husbandry and miscellaneous matters, were straightforward accounts of the stage of development of the poultry industry in a number of countries. Interesting as such accounts can be, they did not provide a basis for the discussion of problems which were concerning the practising poultry-keepers present, who were mostly from North-West Europe and North America. To them, Professor Westermarck's (Finland) paper on economic analysis was of value. He concluded after the presentation of his data that, when the egg revenue is at least four times the production costs of a pullet, the most profitable replacement interval would be a year; but when it is lower, the most profitable replacement period is two years.

A good deal of interest was evinced in the contributions on table poultry marketing, and in this field the papers by E. Karpoff and M. C. Small of the U.S.A. on broiler production and increased turkey consumption, respectively, attracted a large audience.

Egg quality and its preservation secured most interest in the Miscellaneous section. The vexed subjects of packing eggs, methods of preservation by oil, and improved methods of testing for quantity, all received attention in papers by N. E. Holmes (England), E. S. Snyder (U.S.A.), A. W. Brant

(U.S.A.), and their co-workers. Two papers on bacterial infection by McNally (U.S.A.) and R. F. Gordon and J. F. Tucker (England) were of particular interest, and the work described offered hopes that the scientist will soon be able to demonstrate practical methods of reducing losses in eggs during storage.

It has been a criticism of many international scientific congresses that social engagements leave little time for valuable discussion. This criticism could not be directed at the Tenth World's Poultry Congress. Enjoyable as the social side was, every scientific session found delegates waiting for empty seats in the large but packed lecture theatres, and on each paper discussion continued for the full time allotted. Scotland can well be proud of its first World's Congress.

AGRICULTURAL INDEX NUMBERS AND PRICES

MONTHLY INDEX NUMBERS AND PRICES OF AGRICULTURAL PRODUCTS

INCLUDING EXCHEQUER PAYMENTS (UNCORRECTED FOR SEASONAL VARIATION)
BASE 1927–29 = 100

	Unit Index	Prices used for June 1954 Index	1954			1953		
			Apr.	May	June	Apr.	May	June
All Products	—	—	266*	243*	244	272	251	250
Cereals and Farm Crops	—	—	280	286	292	285	291	298
Livestock and L'stock Products	—	—	262*	231*	231*	268	239	236
		s. d.						
Wheat	cwt.	33 10	324	326	327	311	313	315
Barley	,,	25 2	239	231	229	284	283	279
Oats	,,	22 7	249	244	244	277	274	275
Potatoes	ton	309 6	278	293	308	273	288	303
Hay	—	208 6	192	192	192	204	204	204
Fat cattle	live cwt.	142 6	302	301	289	298	297	287
Fat cows	,,	78 4	216	217	223	218	220	231
Fat sheep	lb.d.w.	2 11½	280	280	276	280	280	275
Fat ewes	,,	1 10	282	276	267	282	276	267
Bacon pigs	score	49 6*	331	324*	324*	376	381	383
Pork pigs	(20 lb.	52 8	314	311	311	359	359	359
Sows	d.w.	20 7	183	179	179	249	249	249
Milk	gallon	2 2½*	269*	204*	204*	268	203	202
Butter	12 lb.	58 6	210	290	279	171	171	171
Poultry	—	—	253	240	230	259	265	241
Eggs	120	36 8*	193*	192*	202*	211	222	217
Store Stock†		£ *s. d.*						
Dairy cows	head	58 8 0	208	209	216	203	207	212
Store cattle	,,	45 0 0	302	304	309	289	293	301
Store sheep	,,	8 2 6	299	309	300	300	300	300
Store pigs	,,	7 0 10	473	456	414	493	514	509

* Provisional † Not included in general index

LESSONS FROM NEW ZEALAND

D. S. HENDRIE, B.Sc.(Agric.), B.Sc.(Est. Man.), Dip. Agric., N.D.A., N.D.D.
Principal, West of Scotland Agricultural College

In an earlier article, Mr. Hendrie, who was until 1953 Agricultural Adviser to the High Commissioner for the United Kingdom in New Zealand, broadly outlined the farming pattern of that country. Here he presents some of the facets of New Zealand's farming practice which, in his opinion, might repay study in Britain.

THE last thing which New Zealand farmers would claim is that they have reached perfection or have acquired miraculous farming skills unknown elsewhere; indeed, the principles on which they farm are basic to the agricultural science of all countries with improved systems of farming. And New Zealanders, like others elsewhere, vary in their personal efficiency. For this reason, the same sort of spectacular expansion in the national farm output would take place in New Zealand, as in the United Kingdom, if the not-so-good farmers were able to raise their level of productivity to that of the élite.

Nor is there much to learn from New Zealand which is suitable for direct and unmodified application in Britain, just as the direct contribution which we can make to *their* problems is also limited. That this should be so is not surprising in view of the striking differences in the environments in which the industry is conducted in the two countries. Some of these differences—New Zealand's more favourable climate (with, in particular, its milder winters, well-distributed rain and generous ration of sunshine); her more limited easy farming lowlands and corresponding preponderance of rugged, inaccessable high country; her higher ratio of land to population; and her almost exclusive concentration on one export market—were outlined in the earlier article in this JOURNAL.*

But in spite of this cautionary preamble, it seems to me—after spending nearly five years in New Zealand and travelling some 54,000 miles among its farmers—that there is much in her farming which will reward our careful study, if seldom for direct application under British conditions then, none the less, for the underlying lessons which it offers. This article seeks, by way of sequel to the first, to outline some of these lessons. If it appears mainly to sing the praises of farm practice "down under", it must be remembered that, as the title suggests and space dictates, it is a chronicle of what is to be learned and not of possible shortcomings which exist there (as here) and of which the best New Zealand farmers and scientists are very much aware.

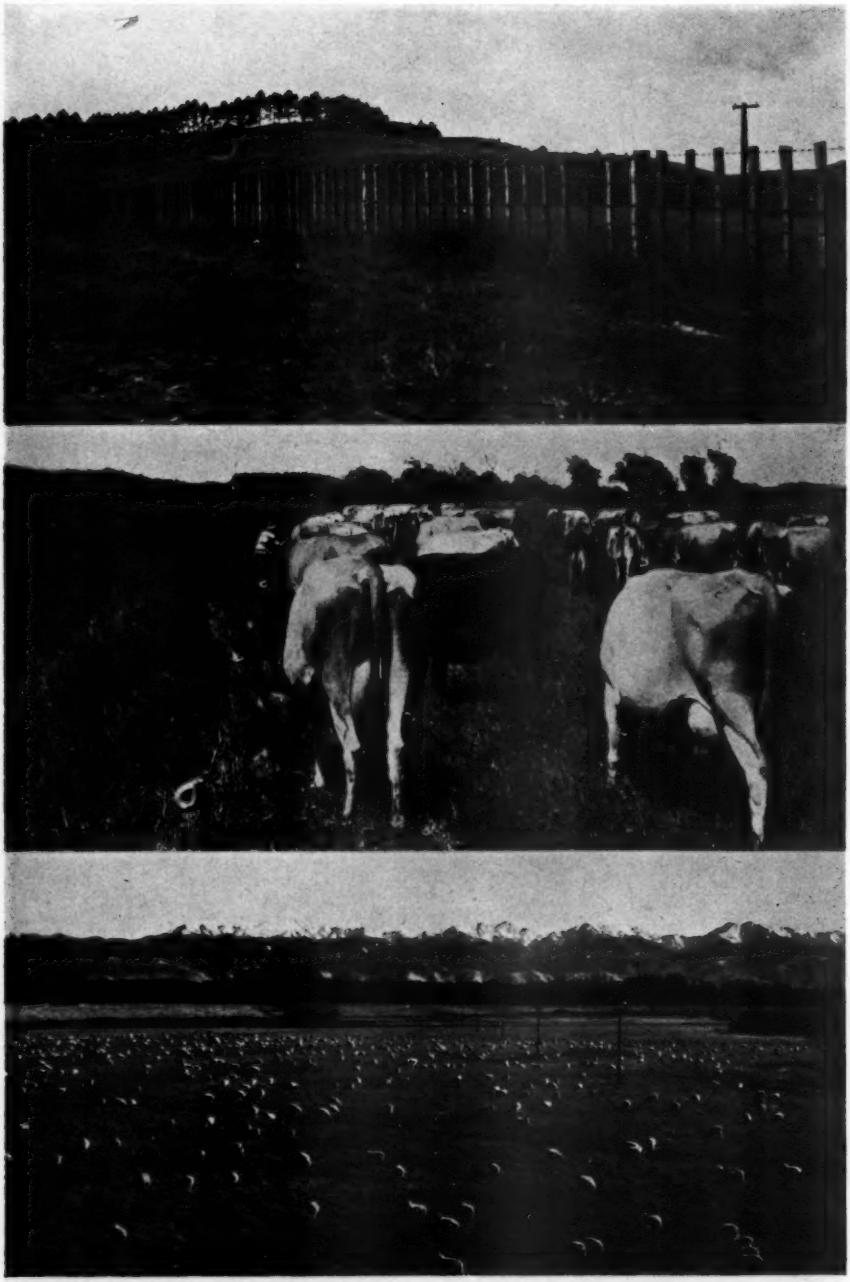
Farming methods in New Zealand must be studied against the background of its agricultural economy and of the place of the latter in the national life; a few sentences will suffice to put these in perspective. The produce of New Zealand farmers accounts for 60 per cent of the country's national income and 96 per cent of the exports by value, by which alone the national standard of living is maintained. Some 70 per cent, by volume, of farm produce is exported—mainly to the United Kingdom—and the domestic population could, so to speak, be fed by farmers working a couple of days a week. Farmers and their workers constitute 20 per cent of the working population. Farming in New Zealand consists overwhelmingly of converting grass into animal products, which indeed make up 90 per cent of total farm income.

*New Zealand Farming. October 1952, **59**, 324-32.

Shearing is virtually a science in New Zealand.

Photos: *New Zealand Department of Agriculture*

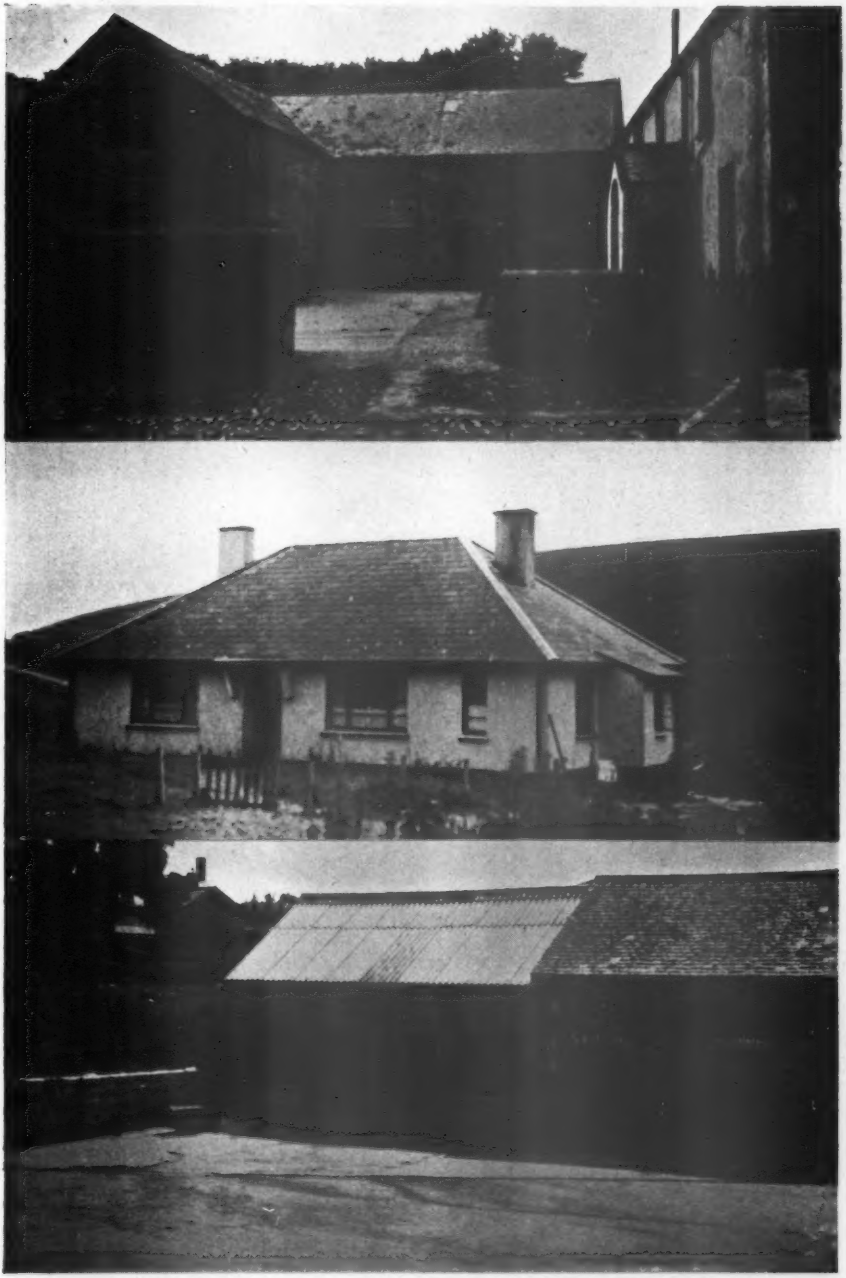
Sheep on the hook: note the uniformity of carcasses.



Photos: *New Zealand Department of Agriculture*

New Zealand Farming.

Superlative fencing.
Increasing use of electric fencing.
High density of sheep stocking.



Improvements under the Livestock Rearing Act.

New yard and reconditioned fattening house at Whitefield Barton, Challacombe.
New bungalow at Bluepits, Exmoor Forest, built for a shepherd.
New calves' house and concrete yard at Swincombe, Challacombe.

Photo: H. E. Rivers

Castle Hill, near Barnstaple.

The production of meat and milk is seasonal, and cattle are not housed. What we call "self-sufficiency" is virtually universal; indeed, concentrates play little part in animal nutrition. Only 10 per cent of the Dominion's milk supply goes into the liquid market. With this (as seen through our eyes) topsy-turvy picture in mind, we can pass to a brief appreciation of some of the factors which seem to make agriculture in the Dominion so successful.

High Output per Man The most striking feature of New Zealand farming is the high output per man. In this respect, the Dominion has a comfortable lead over all other countries*, and it is the principal reason why costs of production of dairy produce, meat and wool are so formidably low. It is easier to state these facts than to explain how such output is achieved. The seasonality of production (that is, the gearing of production to the natural curve of grass growth), the yield of grass made possible by the favourable climate, the elimination of indoor feeding (and of the consequent handling of dung), and the minor place of arable cropping, all play large parts. New Zealand also enjoys the advantages (there are disadvantages as well) of all young, partially-developed countries with much land in relation to the labour force available. The specialization of her farming, to which further reference will be made later, also offers scope for saving labour.

But perhaps the main factor in this high output is what can only be described as an attitude of *mind* towards labour—the conception of labour-saving as an end worth pursuing for its own sake. To many a New Zealand farmer it is more attractive to maintain his existing level of production with one man less rather than to expand it, even if that would be profitable, with an extra man. This approach results in a constant endeavour to achieve ever-greater simplification and more mechanization. Fundamentally, this mental attitude is born of necessity—necessity which was the normal lot of the isolated pioneers who laid the pattern of the Dominion's farming in the second half of the nineteenth century and which has undoubtedly left a strong impression on the thinking of succeeding generations of farmers. In modern times this natural keenness for mechanization has been greatly helped by the almost country-wide availability of electricity.

Clearly in Britain we cannot raise output per man to the same pre-eminent position. We have a very different climate, our economic position denies us the option of sacrificing intensity of production for high labour output, and our market is not seasonal nor so specialized in its requirements. But it may well be that we err to the opposite extreme and it might do us good to cultivate more of New Zealand's attitude towards the intrinsic importance of labour economy.

Good Grass and Maximum Use To many, New Zealand's major contribution in the field of grassland husbandry is her thorough understanding of how to exploit the fertility-cycle which can be generated by the predominantly *in situ* consumption of grass fed by nitrogen captured from the air through the medium of white clover. The white clover is, in turn, stimulated to maximum activity by repeated doses

* Figures quoted in 1939 suggested that, on the basis of persons fed per man working on the land, the approximate output per farm worker in various countries—taking New Zealand as 100—was: Australia, 90; United Kingdom and the Netherlands, 50; Canada, United States and Denmark, 36. The position since may well have moved against New Zealand, but her lead is still clear.

of soluble phosphoric acid. At the same time, the stocking of the grass is heavy. The recipe for all this is, briefly: more phosphate— more clover—more nitrogen—more grass—more stock—more nitrogen. New Zealand scientists have measured what the root-nodule bacteria and the grazing animal together can achieve in this way, and it is most impressive to see how magnificently ryegrass—that lover of good living—will respond to this stimulating environment. Obviously, in the climatic conditions over most of Britain we cannot hope to obtain the same results, and we must rely to a great extent, therefore, on nitrogen out of the bag. But there is a lot to be learned about avoiding the pointless extreme to which nitrogen is applied artificially simply to supply that which a strong stand of clover in the sward would itself have accomplished—had it not been suppressed by that very treatment!

Like us, New Zealanders are finding that the production of grass is technically a simpler task than securing its full and efficient utilization. They have, however, taken enthusiastically to strip grazing, and the majority of intensive dairy farmers there now practise this system for at least the early part of the season. In particular, it is used to avoid waste in the utilization of autumn grass saved for grazing during the lean spring weeks just after calving. They are devotees of the rotational utilization of grass, except possibly for the ewe flock during the period from lambing to weaning, believing (perhaps more sincerely than we do) that alternate severe defoliation and recuperative rest are essential for maximum production. For this purpose, they find the modern, high-fertility strains of grasses supreme because they can, during the recovery phase, be allowed to reach much greater age and bulk without losing palatability and digestibility.

Heavy Sheep Stocking Visitors to New Zealand cannot but be impressed with the density of sheep stocking which is practised. On good land, up to 6 or 7 ewes per acre is not uncommon as the winter-carrying average for the farm. This, of course, means much heavier stocking at certain times and on some areas of the farm. Why the old British adage "a sheep's worst enemy is another sheep" can be challenged so successfully in New Zealand has not, as far as I am aware, been fully explained, but the following may be partial pointers to the answer.

A most striking feature is the extreme shortness of pasture which is considered to be the summer ideal for sheep. It may be that this is advantageous from the angle of parasitic infection. The predominant breed—the Romney—is traditionally accustomed to heavy stocking in its native area, and the choice of breed may, in this context, be a happy one. Rotational grazing (with the exception mentioned earlier) no doubt also plays a part in the control of parasites, and even on the hills a reasonable degree of subdivision and controlled grazing is a feature of the best New Zealand management. A very large proportion of lambs on the fattening land are killed at light weights, straight off their mothers, and this results in a big reduction in the density of sheep on the grass in the late summer. And, in lowland flocks, dosing of sheep is a routine measure.

Handling Livestock One of the most attractive features of livestock husbandry in New Zealand is the efficiency with which cattle and sheep are physically handled. This, in turn, depends on superlative fencing, on constant endeavour to improve the design and layout of cattle yards and sheep pens, and on well-trained dogs. Lack of space forbids the full development of this theme here, but it is one of the most

fruitful fields for us to study. In short, the New Zealand farmer strenuously avoids any possibility that he may be reduced to pitting his own strength, in single combat, against one of his animals! His dehorning bails, calf castration bails, foot-rotting "sheep handlers", lamb holders for docking and castration, sheep races, dipping arrangements, and so on, bear eloquent testimony to the thought which he has devoted to this subject. Above all, he has a passion for good fencing, believing rightly that the first essential of efficient grassland farming is to be able to put stock on a selected part of the farm in the certain knowledge that they will remain there, and nowhere else, for just as long as good husbandry may dictate.

The New Zealander's respect for wool (which provides 30 per cent or more of the natural export income) demands mention. It is reflected in the constant endeavour of even the less scientific sheep farmer to breed for a given quality of wool (that is, by his choice of rams) and in the care with which he sorts and handles his clip. Shearing is virtually a science in New Zealand (the Wool Board there is at present conducting classes on this subject among farmers and shearers), and it is rather surprising that, in our less favourable climate, some British version of the New Zealand "wool shed", with its provision for keeping sheep dry and its convenient wool press, has not been evolved on sheep farms here.

Some Pointers for Dairy Farmers To do justice to those aspects of dairy farming in New Zealand which merit study would require much more space than is available. On the production side, I would specially mention the subdivision of dairy farms into very small fields (further divided by the electric fence as required), the economic advantages of early first calving (the average age is virtually one year younger than in Britain), and the early turning-out to grass of spring-born calves to *precede* the milking herd in their rotational progression round the fields—thus avoiding the evils of the permanent calf paddock. The preoccupation of dairy farmers with sales of milk per acre and per man, and their relative indifference to individual milk records, or even to herd averages, is also most striking. This approach reflects, of course, the fact that in "outdoor" dairying it is the herd and not the cow which is rationed: it also explains why average yields in New Zealand are unspectacular. On the other hand, the regular achievement of the equivalent of, say, 700 gallons of milk at 3.5 per cent butter fat per acre *without the help of any purchased foods at all* indicates the progress which this outlook has promoted. The country-wide use of the "releaser" type of milking plant—with direct flow of milk from cow to cooling room—and the use of strong detergents, which apparently obviate the need (under New Zealand conditions) for sterilization as a separate process, also call for comment.

The bulk collection of milk from farms and the virtually complete mechanization of cheddar cheese production are also of great interest.

The thoroughly practical herd improvement work of the New Zealand Dairy Board, which is based largely on surveys of the performance of sires and the lifetime records of cows and of the best farm practice, is first class. Indeed, it seems probable that no other country has so successfully harnessed its national milk-recording data to the long-term advancement of its dairy industry. In New Zealand, the advisory service recently instituted a very popular scheme for checking the efficiency of milking machines, using specially designed instruments in the hands of trained staff. The value of such a service is indicated by the fact that little over 20 per cent of machines were found to be operating with full mechanical efficiency.

It is difficult not to be impressed with the attractions of seasonal production, as practised in New Zealand. The economic advantages of wintering cattle cheaply and of timing production to synchronize with nature's flush of cheap food are clear enough, but one has actually to see in order to appreciate the additional "human" attractions of a spell of two months or so when milking is virtually discontinued. Then other farm work can be overtaken, the tyranny of fourteen milkings a week is temporarily escaped, and master or man may, with a clear mind, leave the farm for a holiday. It may be looking far ahead but it is perhaps not entirely visionary to picture a time when milk is produced here in sufficient quantity in summer to provide for current needs and for a surplus to be suitably preserved for winter consumption. Already, a surprising number of people in the world only see milk in its preserved forms (which are no doubt still capable of much improvement).

Electricity—A Good Investment New Zealand farming families seem to have reconciled themselves more realistically, and at a much earlier date than most, to the passing of the age of domestic help! One cannot fail to be struck by the extent to which this is reflected in attractive farm kitchens and modern, labour-saving equipment. It is, of course, largely true that this has been made possible by the wide availability of rural electricity. But these amenities go beyond the intrinsic importance of properly equipping what is, after all, the power-house of the farm, and providing for the comfort and happiness of the farmer's wife, important as these considerations are. The fact that there is in New Zealand nothing to choose, on the average, between the attractiveness and labour economy of town and of country homes has undoubtedly a decided influence on the number of country boys, and even more of girls, who will resist the lure of the town. And, even if on *small* farms labour-saving household equipment may, in part, be installed to enable the women of the house to give some outdoor assistance, its provision is still a valuable gain to happiness and economy. Such amenities cost money and they must, of course, compete with other claims on available capital; the interesting point is that so many New Zealand farmers consider them a good investment.

A High Degree of Specialization There can be few farming economies which provide better opportunities than does New Zealand's for the study of the value, or otherwise, of specialization in farm production. There, the agricultural income is comprised 50 per cent of sheep and wool and 35 per cent of milk, leaving only 15 per cent to come from all other items. Production is based overwhelmingly on grass. Nine-tenths of all New Zealand's exports consist of only 4 or 5 products (butter, cheese, dried milk, carcass meat and wool) and four-fifths of them go to the United Kingdom. Farmers are usually "sheep farmers" or "dairy farmers", and the label "mixed farming", which is so revealing over so much of Britain, has little application in New Zealand. About 85 per cent of dairy cattle are Jerseys and, apart from specialized, fine-woolled breeds of sheep kept on the dry high country, 90 per cent of breeding sheep in New Zealand are Romneys. The Southdown has a clear ascendancy as a fat lamb sire. The whole dairy industry is co-operative and the entire export surplus is marketed by one industry-controlled agency.

Is all this specialization good and ought we to imitate it here? Clearly, it has served the Dominion well. No country producing for large-scale export can compete with New Zealand's costs of production; her output

per man is very high; her products are world famous for their uniformity; her concentration on relatively few breeds has made livestock improvement simpler, the market for surplus breeding stock wider, and the choice of sires larger; and concentration on relatively few enterprises gives her farmers more chance of becoming really expert in their own line. There are, of course, some disadvantages. New Zealand is peculiarly vulnerable to the world prices of a very short list of commodities, and her farmers have lost some of the traditional British knowledge on cropping and mixed farming—a loss which some unexpected economic twist of fortune may yet prove to have been unfortunate.

Anything approaching New Zealand's degree of specialization is, of course, neither practicable nor desirable here. In Britain, intensity of production must be a major aim; cropping must mingle with grass and livestock, both for human and stockfood reasons; and local consumption—including winter consumption—dominates the picture.

But New Zealand practice does, at least, seem to lend weight to the view that diversification is sometimes pushed too far in Britain (especially south of the Border), where farming has, in these times, become so highly technical that the number of enterprises which the average farmer can handle really well is limited.

Open Approach to New Ideas In conclusion, one cannot but admire the open-mindedness of the average New Zealand farmer to what the agricultural research worker and the advisory officer have to offer. This "try anything once" attitude thrives on the comparative lack of tradition in New Zealand agriculture. There, a surprising number of the present generation of farmers are not the sons of farmers. This, together with a certain carefree exuberance natural in a young country, and an inherited aptitude for improvisation, doubtless accounts for the less important part which tradition plays. Incidentally, as it becomes more and more difficult for young men to find the capital to begin farming, it seems likely that, as in Britain, a more static community of farming families will evolve.

British farming is admired for its tradition by New Zealand farmers, and, in the end, the advantages of tradition probably outweigh its disadvantages. But during the convulsive changes which have characterized the years since 1939, a degree of freedom from it seems, on balance, to have been an advantage to the Dominion.

Closing of the Mushroom Research Station

As a result of arrangements made between the Mushroom Research Association Ltd., the Glasshouse Crops Research Institute, and the Ministry of Agriculture, the Mushroom Research Station at Yaxley will close before the end of the year. Mushroom research will be resumed at the new Glasshouse Crops Research Institute, Littlehampton, Sussex, as soon as suitable buildings and equipment are ready.

GOOD ESTATE MANAGEMENT

A DEVON AND SOMERSET ESTATE

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ONE of the best-known houses in the West Country is that of Castle Hill, near Barnstaple, the property of the Lord Lieutenant of the County of Devon, The Rt. Hon. the Earl Fortescue. This great house is the centre of one of the largest landowning and farm enterprises in this part of England, made up of three estates—the Castle Hill Estate (9,000 acres), the Exmoor Estate (14,000 acres), and the Challacombe Estate (5,000 acres)—all lying in some of the most beautiful parts of the West Country.

Castle Hill The Castle Hill Estate consists of sixty-eight equipped farms and smallholdings over 15 acres, which are let, as well as the Home Farm of 600 acres. The land rises from 250 feet in the south to 800 feet in the north, the average yearly rainfall is 40 inches, and the mean average temperature 43°F. Considerable frost occurs in the valleys which intersect the estate from north to south. The northern part of this estate is on the Culm Measures, known locally as Shillite, while in the middle there is a belt of clay. The best land is on the limestone in the south.

Nearly all the farms produce milk, especially during the summer months. The acreage of cash crops is not large and most of the arable land is used to grow green food for the sheep. All the farms have ewe flocks—chiefly Devon Closewools—while Devons are the usual cattle kept. Both the sheep and cattle are generally finished on the farms on the limestone and lower land: the majority, and particularly those that have been kept on the higher land, are sold as stores.

Where milking is done all the year round, the cowhouses are being brought up to the standards required by the Milk and Dairies Regulations, and the farmers have become attested producers. A survey of the remaining milk producers is being carried out by the County Milk Production Officer, and the requirements for the cowhouses will be considered, but it is not thought reasonable that any owner should bear the expense of bringing part-time producers' buildings up to Milk and Dairies standard when there are many more pressing needs for capital expenditure.

The rents of the farms which are let range from £1 to £3 per acre, generally according to size, but the cost of repairs has become so heavy that these rents are not high enough to give a proper return on the capital invested in the estate.

On the Home Farm there is an attested herd of 60 Ayrshires. This breed was chosen not only for their milking properties but also because they are hardy enough for the old cows to be drafted up to Exmoor for the shepherd's use. There is also a flock of 200 Cheviot ewes, which are drafted to Castle Hill from Exmoor after they have dropped four lambs. They are then crossed with a Border Leicester ram and sold with their lambs in the autumn. Lambs on Exmoor which cannot be sold off by the autumn are brought down to Castle Hill for wintering, returned to the moor again for the next summer, and sold fat in the following autumn. Wessex sows are crossed with Large White boars, all the pigs being sold off for pork.

The woodlands at Castle Hill cover 1,250 acres, and of these 1,080 acres have been dedicated. A staff of 22 under a Head Forester includes two carpenters and two drainers. Since 1921, between 12 and 15 acres have been replanted each year, and whilst this may not appear a lot, it should be remembered that the present cost of replanting is £50-60 per acre. The policy has been to do away with hardwoods, which are generally not suited to the soil or climate (except on the clay, where oak and ash do fairly well). The usual conifers planted are Japanese larch, Douglas fir, and Sitka and Norway spruce. It is perhaps noteworthy that while European larch becomes infested with canker in these conditions, Japanese larch does exceptionally well: one plantation had to be thinned at ten years old and will need doing again at thirteen years.

Rabbits are a problem, particularly in some old limestone pits which had been planted with conifers. The rabbit-proof fencing can, however, generally be removed when the plantations are about seven years old. The dedicated woodlands in 1950 comprised 140 acres of broad-leaved trees, 450 conifers, 150 acres of mixed woods and 330 acres of felled woodland. This last figure refers to trees which were felled during the last war—a striking example of the reserve of timber that a well-managed estate can provide in an emergency.

Next to regular replanting, the most important task is thinning, and in 1950 it was estimated that 800 acres would require such treatment over the next ten years. The thinnings of the better woodlands are usually sold standing, the work of removal being carried out under the supervision of the Head Forester. It has been found very difficult, however, to sell the thinnings of the poorer woodlands, particularly the hardwoods, and the work here is therefore carried out by the estate staff. In addition to the quantity sold, the woodlands provide all the timber needed for estate repairs and for gates. Practically all boundaries consist of banks with thorn and beech on top, so little fencing is required, other than wire posts for the top of the banks.

Exmoor Forest The Exmoor Estate was formerly a Royal Forest and the story of its reclamation has been written by Mr. Orwin.* Nevertheless, a few paragraphs here on this interesting subject may not be amiss. The reclamation of Exmoor began in 1815, when the Act for its enclosure was passed. In 1818 the Commissioner for Woods and Forests advertised the Exmoor Allotment, which then included 10,262 acres and an enclosed farm of 108 acres, for sale by tender. Mr. John Knight of Wolverley Hall, Worcester, bought this allotment for £50,000 and then added to it by the purchase of adjoining lands, until he owned more than 15,000 acres. He laid out twenty-two miles of road across the forest and attempted to grow corn crops on the land, much as though he was farming in the Midlands. He also endeavoured to improve the stock (chiefly sheep and ponies) and extended the practice of running cattle from lowland acres on the forest during the summer. But John Knight had no idea of colonizing the forest, and in twenty years he built only two farmsteads and about eight cottages; nor did he attempt to improve this bleak area by providing shelter-belts.

In 1841 John Knight handed over control of the forest to his son Frederic, who by 1848 had built nine farmhouses with cottages and buildings for letting to tenants. In 1850 John Knight died and his son became the absolute owner. By that time three more farmsteads had been built and the land let to tenants. Frederic Knight, as well as letting, farmed a great part

*_The Reclamation of Exmoor_. C. S. Orwin. Oxford University Press, 1929.

of the forest and endeavoured to improve the land by the growth of turnips, followed by rape pastures left down for as long as they would last.

During the next decade, the farms seem to have become unlettable and more of the land came into the occupation of the landlord. In 1879, Frederic Knight lost his only son, whom he had hoped would succeed to the estate, and when Frederic Knight died in 1897 the property came into the ownership of Lord Fortescue, who made it over to his son Lord Ebrington. Since then, some land has been sold. In particular, Honeymead Farm, with 1,570 acres, was sold in 1929 to Sir Robert Waley Cohen, whose son now owns and farms an extensive estate there.

Lord Fortescue now owns 14,000 acres on Exmoor, of which 9,000 acres, comprising three homesteads, are in hand. In addition, a further 1,130 acres of rough grazing is rented. On the remaining 5,000 acres there are seven equipped farms with homesteads averaging from 200 to 700 acres in size, let at rents which vary from 15s. to 20s. per acre. There are also six blocks of bare moorland ranging from 80 to 400 acres, let at rents of from 2s. 6d. to 10s. per acre.

The soil on Exmoor is mostly peat and the land rises to nearly 1,600 feet. The average rainfall is 72 inches a year. There are 100 acres of woodland, of which 70 acres are conifers, situated on the sides of the valleys. They suffered some damage during the floods of August 1952, when the North Devon town of Lynmouth was so badly devastated.

The Home Farm, which covers 10,700 acres, consists of three homesteads built by Frederic Knight, and is divided into seven herdings, each with a shepherd. The staff, including the shepherds, numbers 18, and is under the charge of a bailiff. On the holdings there are 3,400 breeding ewes which, with the exception of one herding which has 440 Scotch Blackfaces, are all Cheviots. There are, in addition, 3,200 lambs and 160 rams. The cattle are all Galloway or Galloway crosses. Altogether, there are 215 cows and heifers, 130 steers and heifers between 2 and 3 years old, 5 Galloway bulls, one Hereford bull, and 110 calves. The sheep and cattle are hardy enough to stand any winter on the moor and little is given to the breeding ewes, other than rough hay during the snow. The cows get silage, hay and oat straw during the winter. The usual practice has been to send some of the Galloway x Hereford stores to be finished at Filleigh at 2½-3½ years, but it is now proposed to sell them all off as stores at 2½ years, or as yearlings if a satisfactory market can be found.

The limiting factor to the numbers of stock that can be kept and reared on the moor is the amount of fodder that can be produced during the summer. Usually, 120-150 acres of hay and silage are made each year. Trials are to be carried out this winter on the self-feeding of silage, and this year some hay has been made on tripods, although because of the very bad weather it was made very late.

The moorland pastures are improved in turn by ploughing and reseeding. Lord Fortescue started his improvements at the beginning of the war and since then over 1,500 acres have been ploughed and reseeded. During 1954, 90 acres of these will again be ploughed up and reseeded under turnips and rape, and a further 30 acres will be reclaimed as part of an improvement scheme under the Hill Farming and Livestock Rearing Acts. The leys are usually left down for 3-5 years, or longer if the sward is good. Lime is applied in the first year and basic slag the second, the quantities being decided by soil analysis. Thistles and rushes appear very quickly on the reseeded land, but spraying is very effective in keeping them down.

Challacombe Estate To the west of Exmoor is the estate of Challacombe, which includes the small hamlet of that name and another known as Barton Town. The estate is on the Culm Measures and the moorland peat. The land rises to a height of 1,350 feet and the annual rainfall is 60-70 inches. There are only 24 acres of woodland, which were originally planted with a mixture of beech and larch, although few of the larch have survived.

There are fifteen farms on this estate, ranging from 67 to 800 acres in size, and five equipped smallholdings of under 20 acres each. The rents are between 10s. and 20s. per acre for the farms and about 30s. per acre for the smallholdings. Repairs and improvements are generally carried out by contract during the summer months: owing to the high rainfall and cold winters, very little work can be done at other times.

Repairs and Maintenance The repairs at Castle Hill and at Exmoor are carried out by the estate staff, which includes a Clerk of Works and fifteen men (masons, carpenters, painters and a plumber). Generally, large improvements are carried out by outside contractors, but small schemes have been done by the estate staff. The buildings are generally of stone or cob with slate tiles or thatch. There is a thatcher on the estate who usually works with combed wheat straw, which gives a good roof but is expensive. The policy is to do away with thatch wherever possible, but the timbers of the thatched roofs are usually found to be so uneven and defective that where replacement with other material (usually corrugated asbestos) is desired, complete new roof timbers are needed. Where any alterations or improvements are done to the cob-walled buildings, the cob is replaced by concrete blocks, a satisfactory finish being obtained with roughcast. These blocks are made on the estate by an old-age pensioner and are very satisfactory. Bricks are difficult to obtain and are rarely used.

There are two carpenters at the Exmoor estate yard and sawmill who carry out repairs as well as making gates and sawing up the timber. It has been the practice in the past for the estate staff from Castle Hill to come up during the summer months to help out with the repairs, but owing to pressure of work at Castle Hill it is doubtful if this can be continued. All the farmhouses and buildings at Exmoor are substantially built of stone and slate, as designed by the Knights or their agents, and, although severe in appearance, the buildings add to, rather than detract from, the beauty of the landscape.

At Challacombe the repair work is done by contract, as there is too much work on the rest of the estate to permit the use of the Castle Hill staff.

The question of repairs is a landowner's chief worry, and since the war the average percentage of the gross rents spent on repairs on the three estates has been approximately 70 at Castle Hill, 40 at Exmoor Forest, and 30 at Challacombe.

Hill Farm Improvement Special mention must be made of the improvements on "eligible" farms, which have been carried out with grant-aid under the Hill Farming and Livestock Rearing Acts. At Castle Hill, a scheme for the improvement of one farm has been completed, and schemes for a further eleven farms have been prepared and will be completed as soon as the labour, either contract or estate, is available.

On six of the seven tenanted farms at Exmoor, schemes have been completed: the remaining farm should be completed this year. Under various schemes at the Exmoor Home Farm, new bungalows and three lambing sheds have been built, a water supply has been installed and the yards at the farmsteads have been concreted. A scheme has been prepared and will shortly be started to plant 10 acres of shelter-belts, which will help to repair the omission of John Knight in the early days of reclamation. Beech and Norway spruce will probably be used, as both varieties have grown well on Exmoor. Beech has already been planted successfully round the homesteads.

On seven of the farms at Challacombe, Livestock Rearing Schemes have been completed, on three farms work has been started, and for two others schemes have been prepared and should be completed this year. The schemes include repairs to the farm roads, erection of buildings for livestock, provision of implement and tool sheds, modernization of the farmhouses and cottages with bath and indoor sanitation, concreting of the farmyards, general repairs to the buildings, and also reseeding, manuring and drainage by the tenant. On the typical farm at Challacombe a good tar macadam road about ¾ mile long has been made to the farm. Adjoining the stone-built and slated farm buildings, which include a barn with loose boxes and rearing pens, a building of concrete blocks and asbestos roof, with a double range of three rearing boxes and hay loft, was put up. A water supply has been installed for the land and buildings, and the old yard has been concreted. A modern range and bathroom and sanitation system was put in the farmhouse, 14 acres were ploughed and reseeded by the tenant, an extensive fencing scheme was carried out, and 50 tons of basic slag were applied to the grassland.

As a result of schemes such as these, the farm roads to some isolated farms are generally in very good order, but damage was done to them by the 1952 floods and some damage still remains to be repaired.

The general practice for financing these schemes is that the Estate and tenant each pay 25 per cent of the cost, the remaining 50 per cent being met by the grant. And while the tenant receives no compensation at the end of his tenancy, no increase in rent is charged. This arrangement has generally been satisfactory to both parties, but where the tenant for some reason does not wish to make a lump sum payment, interest is charged on the net cost of the improvement.

Water supplies on the estates are adequate, thanks to natural sources and private installations, but 75 acres at Challacombe have been sold to the North Devon Water Board to make a reservoir to add to the water supplies of the district. The great need to increase production and amenities on the estates is an adequate mains electricity supply. There is mains electricity at Castle Hill, Filleigh and West Buckland, but on the remainder of the estates the farmers must do without or provide their own supply.

The emphasis on these estates must always be on grass and the production of livestock rather than milk. Lord Fortescue has increased production in his farms through ploughing, reseeding and other improvements by at least 50 per cent, and through the hill farming improvement schemes his tenants have been able to make a good contribution to increased production.

The writer wishes to thank Lord Fortescue and his Agent, Mr. J. M. B. Mackie, for their ready and helpful assistance in the preparation of this article.

THE CATTLE OF BRITAIN

11. JERSEY

IT is thought that the Jersey breed may have originated in Normandy and Brittany, the fawn and white colouring being attributed to the former and the darker colours to the latter. And as in early times the Channel Islands were either joined to the mainland of France or separated by only a narrow channel, this appears to be a possible theory. But whatever may have been the actual origin of the present-day Jersey cow, the earlier inhabitants of Jersey soon realized that it would be very much to their advantage to keep the breed as pure as possible, and for nearly two hundred years the introduction of live cattle from sources outside the Island has been forbidden by Acts of the States of Jersey. It is now accepted there are more Jersey cattle in the world today than any other individual breed of dairy cattle, and it is remarkable that they all owe their existence to this small island, measuring approximately eleven miles long and seven miles across at its widest point.

In England, Jerseys were evidently fairly well known, even before 1800, when they were usually called "Alderneys", due no doubt to the fact that the ships bringing the cattle across were known then as Alderney Packets. The year 1811 saw the foundation of Lord Braybrooke's herd at Audley End, Saffron Walden, to be followed in 1827 by the formation of an even more famous herd, owned by Philip Dauncey—the first great constructive breeder of Jerseys in Britain. In 1844, classes appeared at the Royal Show for Channel Island cattle for the first time, but it was not until 1862 that Jerseys were allotted entirely separate classes. The English Jersey Cattle Society was founded in 1878, and the first Herd Book was published in the following year. Today the Society enjoys a membership of over 5,000, and has published sixty-five Herd Books, the last one containing the pedigrees of some 20,000 calves born in 1953.

The ideal Jersey is a wedge-shaped, beautifully formed and graceful animal, with plenty of depth through the heart, of good body capacity, and having a large udder and well-placed teats. The cow rarely exceeds 8 cwt., the average weight in England being approximately 850 lb. The characteristic marking is a light, mealy ring around the nose, whilst colours are various shades of fawn, mulberry, broken fawn and white, mulberry and white, and grey. It is undoubtedly a very hardy animal. Size and beefiness should not be confused with constitution and, although the Jersey is small and fine skinned, she is naturally adaptable to extremes of climate. For example, visitors to tropical countries have remarked on the astonishing ability of the Jersey to continue milking during periods of extreme drought, even though the animals have had to travel long distances for water. Further, what is said to be the "farthest north" dairy herd, situated on the Peace River in Northern Alberta, where conditions are particularly severe, consists entirely of Jerseys.

Ability to produce a calf at an early age is one of the breed's most valuable assets, and it has always been an accepted practice for heifers to calve down at two years old, or very soon afterwards. Normally, they produce their second calves when about three years old—an age when some other breeds are calving for the first time. Economy of production is one of the most important factors in dairying, and here again the Jersey has many points in its favour, as although the actual production ration is the same as that for other

breeds, owing to her smaller size the Jersey cow requires less food for maintenance. Compared with an animal of a larger breed averaging, say, 1,350 lb. live weight, the annual saving in food with the Jersey is equivalent to about 1,000 lb. hay and 3,000 lb. roots per cow.

Jersey cattle have been bred pure for a longer period than any other British breed of dairy cattle, so it is not surprising that one of the principal features is that of prepotency—or the inherited ability to pass on to the progeny outstanding points of the breed. Jersey bulls have not been used to any great extent in England for crossing purposes, but in New Zealand, Australia, and N. America they are widely utilized for grading-up other stock.

For many years commercial farmers in England were sceptical of the Jersey breed's ability to produce sufficient milk to ensure economic production, but this erroneous idea has been corrected by the amazing results achieved by the Jersey in open competition with other dairy breeds. At the London Dairy Show, the Buckhurst Trophy, which is offered for the best cow of any breed, per 1,000 lb. live weight, and taking into consideration production over the last three lactation periods as well as the results of milking trials at the Show, has been won by Jerseys on several occasions since its inception. The breed was again awarded the Trophy at the 1953 Show. In addition, Jerseys won the National Milk Cup and the Breeders' Milk Production Trophy, both open to all cows at the Show.

The world's Jersey record for daily production is held by the English-bred cow "Moors Pacified Diana", which yielded 120¾ lb. milk in twenty-four hours, while the present world milk and butterfat record for a Jersey is held by "Stranges Musical", (also English bred), which with her third calf produced almost 25,000 lb. milk and 1,500 lb. butter fat. As an illustration of lifetime production, a Jersey cow in Hampshire named "Hockley Lila" has recently completed 14 lactations and has yielded 171,846 lb. milk (over 76½ tons), which is believed to be another breed record.

It is of course well known that the Jersey produces the world's richest milk. The average butterfat content is well over 5 per cent, whilst many herds average nearly 6 per cent. Jersey milk is also rich in solids-not-fat, so the product commands a special premium when sold on a bulk contract.

Although there have been many instances of Jerseys producing over 2,000 gallons in a lactation, the breed's great asset is its ability to yield, say, 1,000 gallons at over 5 per cent butter fat, produce a calf every twelve to thirteen months, and continue this cycle over a goodly number of years. With sensible and constructive management, coupled with adequate and correct feeding, the Jersey cow is definitely a commercial proposition, and there is no doubt the animal is extremely suitable for any conditions likely to be found in this country.

E. Ashby,
Secretary,
English Jersey Cattle Society

12. KERRY

THE exact origin of the Kerry is a subject pondered by many, but few will deny the breed's ancient lineage. For our purpose, it is sufficient to say that, since the earliest times, Kerry cattle have existed as a distinct breed in Ireland; indeed, for centuries they were the *only* breed of cattle there. They have survived the many importations of other breeds into their particular domain—the mountainous district of South-West Ireland—and today upon the Kerry hillsides may be seen many splendid animals which, with like care and management, need concede nothing to their more sophisticated sisters of the Herd Book.

The cow, when in good breeding condition, weighs about 750 lb. She has a black, glossy coat, sometimes with a little white on the udder, a soft, mellow skin, and handles well. She is well ribbed, of good girth, deep in the quarters and flanks, and has plenty of udder room. Her head is light and clean with thin, tapering horns, turning upwards, curving inwards and gracefully turned back at the tips. The horns are generally white with black tips. Her whole appearance is lively. The bull should weigh about 1,250 lb. and is essentially masculine in appearance, showing off to great advantage the breed's gay and alert carriage. He is usually quiet and easy to handle.

Whilst pre-eminently a dairy breed, the Kerry will, when necessary, fatten readily. Fat steers have been shown at Smithfield and commented upon very favourably by the butchers. It is also recorded that after the First World War a group of Kerries, sent to France under the repopulation scheme, were kept in an orchard meadow of best feeding value, and in a few months put on flesh to such an extent as to resemble beef cattle. The carcasses were described as of "best quality".

But the Kerry's chief asset is as an economical producer of quality milk. From a Kerry of about 700 lb. one can reasonably expect with normal management a yield of 7,000 lb. of milk with a butterfat content in the region of 4 per cent. Add to this a good constitution, easy and regular calvings, relative low maintenance cost, longevity, ability to thrive where others would languish, comparative freedom from minor ills (with the resulting saving on veterinary bills), and the resultant picture is of an extremely efficient "converter" well worthy of investigation by the discerning breeder who yearly finds his mounting costs outstripping his budget. With regard to performance, the following brief details of a few animals, all of which are still milking, amply illustrate the breed's capabilities:

Cow	Total Milk Yield	Lactations
	lb.	
Brookwood Primrose	90,325	10
Hookland Jasmine	83,418	10
Coolock Sloeberry	81,581	9
Drumgaunagh Black Meg	76,762	10
Raheen Pern	72,743	7

Another cow, "Buckland Juno", gave a record yield of 85 lb. of milk in twenty-four hours. Her first four lactations were: 9,401 lb.; 11,240 lb.; 18,250 lb.; and 16,300 lb.

If further proof of yield is needed, the result of the Society's Ashdown Cup competition over the past five years has shown the leading herds to have averaged 8,950 lb. during the milk-recording year.

The *Journal of the British Dairy Farmers' Association*, in paying a tribute to the excellence of the Kerry exhibits in the milking trials at a pre-war Dairy Show, said:

> "... in fact, it was only the exceptionally successful exhibit of another breed that prevented the Kerry class from being the main feature of the Show. Every animal present easily exceeded the class standard of 90 points and the average was 106.6 points. The first prize was gained by "Buckland Peace 2nd". This cow, weighing only 8 cwt. 38 lb., produced 56.8 lb. of milk daily during the trials and gained 134.2 points—a higher total than was gained by any pedigree ... She was awarded the National Milk Cup."

Kerry milk is especially valuable for children and invalids, because the globules of butter fat are smaller than usual, making it more easily digested. Its keeping qualities are excellent.

The grading up of Kerries is simple. Subject to compliance with minimum milk and fat requirements (5,000, 6,000 and 7,000 lb. of milk at 3.7 per cent butter fat for first, second or third lactations, respectively), and after inspection, animals may be admitted to Class A of the Appendix. Their female progeny, if got by a bull in the Society's Herd Book (started in 1892) and after compliance with similar requirements as for Class A, may be entered in Class B. Female progeny of Class B, if got by a bull in the Society's Herd Book, may be entered for full registration.

Because of the paucity of their native pastures and their well-known foraging habits, it is frequently suggested that Kerries are suited only to poor land. Nothing could be farther from the truth. Although they do extremely well on poor land, they also develop well in size and productive capacity when transferred to richer pastures. Today, herds can be found on some of the richest land in England and Ireland, and the owners have no cause to regret their choice.

Artificial insemination has not yet brought to the Kerry the benefits which it has afforded other breeds, because the Kerry herds are so scattered that the demand in any one area has not so far justified a bull standing at a public centre. There is, however, a private A.I. centre for Kerries at Holmwood, Dorking, Surrey, and although this cannot deal with all inquiries, it has sent semen as far afield as the Isle of Man (to which it goes by air). The advent of deep freeze semen may open up possibilities to the Kerry, and provide a perfect answer to the problem. The Council of the Society is very much alive to this development. Semen from a Kerry bull has been successfully frozen and it is hoped that arrangements may be made for supplies to be available in the near future. It is felt that country-wide A.I. facilities for Kerries should bring a measure of prosperity to areas inadequately stocked and prove a real boon to the farmer who, through A.I. considerations, is often forced to keep a breed less suited to his farm.

I am often asked why, with so many virtues, the Kerry is not more numerous. The fact is that the breed has never made an adequate bid for popularity. Basic worth alone is seldom enough to sell any commodity: it must, more than ever in these days of rising costs, be allied to high finance. The position has perhaps been well summed up by the contributor who, in writing of the Kerry in *Britain Can Breed It*, said "Some day someone will take up the Kerry and develop it on commercial lines. Publicity and practical example are wanted to put the breed where it should be on the map. Once there, it will remain a prominent feature."

R. O. Hubl,
Secretary,
British Kerry Cattle Society

13. LINCOLN RED SHORTHORN

WRITING on Lincolnshire in 1799, Mr. Arthur Young, the first Secretary of the Board of Agriculture, said:

> "Mr. Turnell has a breed of cattle which are not surpassed by any in the country for points highly valuable, or their disposition at any age to fatten rapidly. His bull covers at a guinea, and has many cows sent to him . . ."

These words referred to the forerunner of the present breed of cattle known as Lincoln Red Shorthorns, and they are as true today as they were then.

The original cattle of Lincolnshire in their unimproved state were distinguished by their enormous size, and it was not until the late eighteenth and early nineteenth centuries that their improvement was begun.

From Charles Colling's great Durham sale of 1810, three bulls were sent into Lincolnshire, the animals being lightly shod to complete the journey. There seems little doubt that these and other Durham Shorthorns constituted the foundation blood of many early Lincoln Red herds. Mr. Turnell, of Reasby, near Wragby, Lincoln, successfully bred a wholly red variety of these improved cattle. The "Turnell" animals were deep cherry red in colour, and in addition to reducing the size from the original type, he gave them greater power to fatten quickly.

Thus, when George Coates published his Herd Book in 1822, he included therein both the Durham and Lincolnshire types of Shorthorn, and it was not until 1894 that the Lincolnshire breeders decided to form their own Association.

The first Lincoln Red Shorthorn Herd Book was published in 1896: it contained particulars of 96 herds, and the pedigrees of 293 bulls and 93 cows and heifers. Herds were at first taken in collectively, bulls being individuaally entered and numbered. Later, when firmly established, the compulsory entry of individual females was adopted. Forty-one years after the formation of the Association, it was decided to amalgamate with the Shorthorn Society of Great Britain and Ireland, but this agreement was abrogated in 1941, and since then the Lincoln Red Shorthorn Herd Book has been issued annually. The fifty-fourth edition has just been published. In 1946 the Herd Book was divided into two sections, one for entries from beef herds and the other for qualified entries from dairy herds, whilst in 1953 it was resolved to add a separate section to cater for the interests of those members wishing to breed polled Lincoln Reds.

As indicated by the split in the Herd Book mentioned above, the breed comprises two distinct types of animals—beef and dairy—whilst within the general framework of the former are a number of herds which might claim to be "dual-purpose", although the Society does not acknowledge this description, since no official milk records are available in these instances. There is not the least doubt, however, that if the members concerned could spare the labour and time officially to record the milk yields of these beef-type animals, the results would be eminently satisfactory.

The Beef Lincoln Red Shorthorn is renowned for early maturity, hardiness and docility, whilst the cows make extremely good mothers giving a plentiful supply of milk to suckle their calves. The modern animal is low to the ground, well fleshed although not overweight, but at weight for age cannot be surpassed. Indicative of their ability to put on weight quickly is the fact that at the 1953 Smithfield Fatstock Show the prize-winning Lincoln Red Shorthorns averaged 2.05 lb. per day liveweight gain.

A twelve-month-old steer which has been followed up from birth will attain a baby beef weight of 8 cwt., and, if carried straight on, at around two years old will reach 12 cwt. live weight. Numerous instances can be mentioned in support of this statement, and the following examples are quoted at random. At the 1950 Smithfield Fatstock Show, a Lincoln Red heifer at nineteen months weighed 12 cwt. 10 lb.: a steer, entered at a local market and having been fed on home-grown foodstuffs only, weighed 7 cwt. 3 qr. at one year and six days: a bull of thirteen months, which in the previous ten days had travelled some 500 miles during a strenuous show season, scaled 11 cwt. 3 st.

Lincoln Red bulls are in keen demand for crossing purposes, and of all the beef bulls licensed every year in England and Wales by the Ministry of Agriculture and Fisheries, one-fifth are of this breed. Whatever their age, the cattle are keenly sought after, and the demand far exceeds the numbers available for sale. At one sale in October 1953, 425 steer calves, none more than nine months old, averaged £41, whilst in May this year at a Lincolnshire Fair three-year-old bullocks made up to £98 and fourteen-month-old steers fetched £78.

The Dairy Lincoln Red Shorthorn gives high milk yields, coupled with longevity and regular breeding. Although not as numerous as the beef type, they are very popular in the Midlands, particularly in the Vale of Belvoir. The milk has not only a good butterfat content, but it is rich in non-fatty solids, as a result of which it meets a ready trade with the producers of home-made cheeses. In the Melton Mowbray district, too, steer calves out of Dairy Lincoln Red Shorthorn dams invariably top the price scale in the markets; the sale of one-week-old animals at £25 and upwards is not at all uncommon.

Although originally it was virtually confined to the eastern counties, the all-round value of the Lincoln Red Shorthorn has since resulted in a considerable expansion of the breed, and today registered herds are to be found as far apart as Northumberland in the north and Devon in the south. There is also a growing overseas interest, and since the war cattle have been sent to Australia, Austria, Kenya, Russia, South Africa, and South America.

Lincoln Red Shorthorn breeders look forward to the future with every confidence, and proof of their readiness to meet changing demands is the decision taken last year to make available a separate section in the Herd Book for "Polled" Lincoln Red Shorthorns. The demand both from home and overseas for a polled animal is a challenge that all British horned breeds are having to face. Time alone will tell which breeding policy is correct, but in any case any animal with Lincoln Red Shorthorn blood in it cannot fail to make the grade.

W. Dunnaway,
Secretary,
Lincoln Red Shorthorn Society

14. RED POLL

WASTE is abhorrent to the East Anglian farmer. Nowhere in the world will you find land better farmed than in the fertile arable counties of Essex, Suffolk and Norfolk. Headlands are unknown; fields are cultivated to the last inch. And not only must there be no wasted land, there must be no wasted food either!

This attitude of mind has, of course, been inherited by the East Anglian. A hundred years ago the principal need of the livestock farmer in this area was for cattle which would thrive on the by-products of the primarily arable land. He wanted thrifty animals that would do well with the minimum of concentrates, and a cow that, while giving economical quantities of good quality milk, would yet produce a bull calf that would not have to be slaughtered at birth, but would grow into excellent beef. To achieve that aim, he crossed the high-yielding Suffolk Dun with the Norfolk beef animal, and thus was evolved the Red Poll, a breed whose qualities have since been welcomed all over the world.

Obviously the evolution of the breed was not as simple as all that, since type cannot be fixed without a long period of trial and error. Even today, Red Poll breeders are notoriously discontented, because they are constantly endeavouring to perfect their cattle—ever striving to produce higher yields of better quality milk without losing the wonderful beef conformation for which the breed is famous.

The Breed Society was founded in 1888, and from the start it proclaimed the gospel of dual-purpose cattle. Breeders and members were constantly exhorted to aim for better milk yields without sacrificing conformation and beefing ability. Despite the vicissitudes which farmers have since experienced, when in one decade the emphasis has been on milk and in the next on beef, the object of the Society—to raise good, dual-purpose stock—has never varied. Steadily the sights have been raised, so that today a herd average of 1,000 gallons of milk from beefy-looking cows with all the bull calves reared for beef, is quite common.

For eleven years before the Society was formed, a Herd Book had been published by a Mr. Euren, who became the Society's first secretary. One of the names mentioned in the Herd Book of 1888 is John Hammond, founder of one of the best-known groups of the breed, and grandfather of the geneticist who bears the same name. Mr. Hammond, who was a keen supporter of Red Polls and a firm believer in dual-purpose cattle, provided some milk records to illustrate hereditary aptitude. He could hardly have conceived that sixty or seventy years later his grandson would be looked upon as one of the world's greatest geneticists and animal physiologists.

How does this breed adapt itself as the servant of the commercial farmer? Even when roughly treated, turned out day and night all the year round on hillside or poor pasture, and milked with the minimum of comfort in a bail, the cows will yield satisfactorily. Under good conditions, a Red Poll herd will easily average 10,000 lb. or more of milk per cow.

Although the Red Poll is one of the smaller breeds, the Milk Marketing Board has, during the ten or eleven years in which the Board has been responsible for milk recording, proved it to be, on average, the third best milking breed. The Board's records also show Red Polls to be the longest living of all the milking breeds. Compared with the average for all milk-recorded cattle, four times as many Red Polls live to have their tenth calf. This is a factor which must never be overlooked in the economical management of any dairy herd.

Red Poll beef is excellent. After the last Smithfield Show a firm of butchers from the West Country, who keep stock on their own farm, bought a Red Poll. Later they wrote to say that the carcass was the best they had received during all the years they had been in business. Today, with meat off ration, it is quite impossible to satisfy the demand for the high quality joints such as the Red Poll provides.

There is another feature of this breed which is of immense importance today; *all* Red Polls are polled. This hornless characteristic is dominant, and whenever a Red Poll bull is used on cattle of a horned breed, practically 100 per cent of the resulting progeny are hornless. Such cattle are more contented; they are easier to handle and can do little harm to one another or to man; they are better for yarding and for transporting; and their hides are worth more. In hot countries, too, there are no fly-infested wounds to worry about—which is one reason why the breed is popular in Africa and Australia.

As I mentioned earlier, the breed was founded in eastern England, but it is no longer confined to that area. In recent years particularly, herds have been formed in all parts of the country, and Red Polls are becoming increasingly popular where farmers are aiming at the most economical, rather than at the highest, milk yields.

Red Polls are ideal for yard-and-parlour milking or for use in an outside bail. Apart from their docility, the absence of horns means that they can be confined in a much smaller yard than would be required for horned cattle. The fact that bull calves can all be reared and turned into prime beef is an added incentive for any stock farmer contemplating a change to think in terms of these fine dual-purpose cattle.

A. C. Burton,
Secretary,
Red Poll Cattle Society

Some Articles of Outstanding Interest

● NEXT MONTH ●

Foliar Application of Nitrogen to Grassland — *by* A. J. Low and E. R. Armitage
Economic Production on a General Farm in Dorset — *by* A. T. Haesler and S. T. Morris
Marketing Spring Cabbages: A Survey of Practices — *by* R. T. Deakin
The Glass Sectional Frame — *by* W. E. Shewell-Cooper

Place an order with your newsagent and make *sure* of your copy.

OFFICIALLY APPROVED CROP PROTECTION PRODUCTS

Since the date of the list published in the July 1954 issue of AGRICULTURE (p. 192), the following names of proprietary products have been added to the Approved List under the Ministry's Crop Protection Products Approval Scheme.

Lime Sulphur Washes :		
"BB" Brand Lime Sulphur	Brandram Bros & Co. Ltd.	**C.534**
Derris and Lonchocarpus Sprays :		
Shell Derris E	Shell Chemicals Ltd.	**H.490**
Wetters and Spreaders :		
Manoxol OT/A	Hardman and Holden Ltd.	**L.445**
Nicotine :		
Vitax Pure Nicotine	Vitax Ltd.	**M.539**
DDT Dusts :		
De De Tane 5% DDT Dust	The Murphy Chemical Co. Ltd.	**AD.448**
DDT Sprays :		
Arkotine DDT (Miscible)	Shell Chemicals Ltd.	**AE.492**
De De Tane 50% Wettable Powder	The Murphy Chemical Co. Ltd.	**AE.449**
Benzene Hexachloride Dusts :		
Gammalin 2	Plant Protection Ltd.	**AK.528**
MCPA (4-chloro-2-methylphenoxyacetic acid) Sodium Salt Sprays :		
Ialine MCPA Sodium Salt (Triple Strength) (*for cereals and grassland*)	Burt, Boulton & Haywood Ltd.	**BJ.538**
2,4-D (2,4-dichlorophenoxyacetic acid) Amine Salt Sprays:		
Shell D.25 (*for cereals and grassland*)	Shell Chemicals Ltd.	**BM525**
Organo-Mercury-Benzene Hexachloride Dry Seed Dressings :		
Mergamma D (*for use on cereals*)	Plant Protection Ltd.	**BR.541**
**Parathion Sprays* :		
Fosferno 20	Plant Protection Ltd.	**CC.442**
Murphos Parathion 5	The Murphy Chemical Co. Ltd.	**CC.434**
BHC Smokes :		
Fumite Lindane Pellets	Waeco Ltd.	**CG.518**
BHC-DDT Smokes :		
Fumite DDT-Lindane (*generators and pellets*)	Waeco Ltd.	**CH.516**
Oil Herbicides :		
Shell W	Shell Chemicals Ltd.	**CL.491**
Organo-Mercury Foliage Sprays :		
P.P. Mercurial Fungicide	Plant Protection Ltd.	**CM.513**

Applications are now invited for the official approval of proprietary schradan sprays. Full particulars can be obtained from the Plant Pathology Laboratory at the address given below.

A booklet giving a list of Approved Crop Protection materials may be obtained free of charge on application to the Ministry of Agriculture and Fisheries (Publications), Chester Terrace, Regent's Park, London, N.W.1.

Ministry of Agriculture and Fisheries,
Plant Pathology Laboratory,
28 Milton Road,
Harpenden,
Herts

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*The use of these substances is governed by regulations made under the Agriculture (Poisonous Substances) Act, 1952. Information can be obtained from the Labour Division of the Ministry of Agriculture and Fisheries, St. Andrew's Place, London N.W.1. (Tel. WELbeck 7711).

THE MINISTRY'S PUBLICATIONS

Since the date of the list published in the June 1954 issue of AGRICULTURE (p. 145), the undermentioned publications have been issued.

MAJOR PUBLICATIONS *Copies are obtainable at the prices quoted from the Sale Offices of H.M. Stationery Office or through any bookseller.*

Bulletins

No. 50 Modern Rabbit Keeping (*Revised*) 2s. (2s. 1½d. by post)
No. 78 Books on Agriculture and Horticulture (*Reissued*) 3s. (3s. 1½d. by post)
No. 138 Irrigation (*Revised*) 3s. (3s. 2d. by post)
No. 151 Carnations under Glass (*New*) 3s. (3s. 1½d. by post)

Technical Bulletins

No. 4 Calculation of Irrigation Need (*New*) 2s. (2s. 1½d. by post)
No. 5 Insects Pests of Crops, 1938-1943 (*New*) 3s. 6d. (3s. 8d. by post)

Other Publications

Agricultural Statistics: United Kingdom, Part I, 1952 (*New*) 2s. 6d. (2s. 7½d. by post)
Bulk Handling of Home-grown Grain (*New*) 1s. (1s. 1½d. by post)
The Farm Tractor (*Revised*) 1s. 9d. (1s. 10½d. by post)
Farmers' Income Tax (*Revised*) 1s. (1s. 1½d. by post)
Prevention of Disease Among Farm Livestock (*New*) 1s. 3d. (1s. 4½d. by post).

LEAFLETS *Up to six single copies of Advisory Leaflets may be obtained free on application to the Ministry (Publications), Chester Terrace, Regent's Park, London, N.W.1. Copies beyond this limit must be purchased from the Sale Offices of H.M. Stationery Office.*

Advisory Leaflets

No. 61 Pea and Bean Weevils (*Revised*)
No. 64 An Economical Sheep-dipping Bath (*Reissued*)
No. 71 Colorado Beetle (*Revised*)
No. 106 Apple Aphids (*Revised*)
No. 332 Spraying Programme for Apples and Pears (*Revised*)
No. 356 Sugar Beet Tops for Feeding Green (*Revised*)
No. 420 Hatchery Design and Disease Control (*New*)
No. 422 Sterilizing Farm Dairy Utensils by Approved Hypochlorite (*New*)
No. 426 Infra-red for Chicks and Piglets (*New*)

Animal Health Leaflets

No. 15 Coryza and Sinusitis in Poultry (*Revised*)
No. 22 Worms in Poultry (*Revised*)
No. 31 Dehorning of Calves (*Revised*)

Fixed Equipment of the Farm Leaflets

No. 22 Cattle Yards (*New*)
No. 23 The Housing of Calves (*New*)

FREE ISSUES *Obtainable only from the Ministry (Publications), Chester Terrace, Regent's Park, London, N.W.1.*

Farm Machinery Leaflets

No. 10 Threshers (*New*)

Farming Topics

No. 7 Profitable Poultry (*New*)
No. 8 Better Upland Grass (*New*)

Other Leaflets

Crops Protection Products Approval Scheme: Approved List, 1954 (*Revised*)
Full-time Agricultural Education in England and Wales, 1954-55 (*Revised*)
Schemes for the Inspection and Certification of Growing Crops (*New*)

Farming Cameo:
45. Holderness, Yorks, East Riding

Immediately to the north of the River Humber and bounded on the west by a line drawn between Hull and the East Coast village of Hornsea, is the low-lying, gently undulating peninsula of Holderness. The soil of the plain, which rarely exceeds 30 feet in height, is mainly derived from glacial drift, giving strong loams with boulder clay subsoils, and, on the higher parts, small deposits of gravel and sand. The pedological uniformity of this 126,000 acres of heavy land, combined with an annual rainfall of 25 inches, has earned for Holderness a reputation as a first-class arable area.

Bordering the River Humber in the south of the area is Sunk Island, which consists of some 8,000 acres of rich alluvial silts, owing its existence to the depositions of this large tidal river and reclamation work carried out since 1660. Most of this district is interlaced with drainage systems, and it is interesting to note that considerable progress had been made with the drainage of this erstwhile area of bog and swamp as long ago as 1797. Nevertheless, inadequate drainage is still a serious problem on some holdings, being complicated in many cases by the custom of "half-dyke" responsibility, whereby an occupier is often only responsible for clearing out one side of a drain.

The average farm size of the area is in the region of 160 acres, but on Sunk Island, where the farms are relatively new, the holdings are more than twice as big.

Although the traditional rotation of fallow—wheat—clover—wheat—beans—wheat, has been considerably modified to suit changing economic conditions and modern farming practice, wheat still occupies almost a quarter of the total arable land. During and since the war, the area devoted to feeding barley has been high, closely rivalling wheat in the acreage sown. Due largely to this increase in barley, Eyespot now causes a lot of trouble in some districts, and partly because of this, the tendency is to grow more spring wheat. Peas for drying are close in popularity to cereal crops and a considerable acreage is grown under contract. Though often a speculative venture, it has an added attraction in its value as a preparatory crop for wheat. Root crops are relatively unimportant, though there are over 2,000 acres of potatoes, those on Sunk Island being of warp standard. A one-year clover ley is grown on most farms, either for hay or grazing, though the change-over to three- and four-year ley systems is making steady progress.

Despite the emphasis on arable crops, there remains over 28,000 acres of permanent grassland in Holderness, much of it in the low-lying "Carrs", where a lot of improvement has recently been made with the help of the various grants available. A stranger might feel that the grassland farming in Holderness could be further improved: however, steady progress towards better grassland management is being made and grass is rapidly becoming accepted as a crop.

It is natural in a corn-growing area that considerable use should be made of the most recent knowledge of new cereal varieties and modern crop-spraying techniques; nor are the Holderness farmers backward in using up-to-date equipment. The combine harvester has been gradually supplanting the binder on most of the larger farms and there is a steady increase in the number of grain-drying installations.

Dairy farming, though not playing an important role in Holderness, is adequate to satisfy local requirements, and especially the demands of Hull.

Substantial buildings allow the yarding of stock on most farms, but summer fattening is very popular. Though in the past large numbers of stores were bought from the northern counties and Northern Ireland, the present tendency appears to be towards the rearing of home-bred stock. Most farms carry an arable flock of sheep, the predominant breeds being Border Leicester or Baumshire ewes crossed with either Suffolk or Oxford rams. With the decrease in the practice of feeding roots, there has been a movement of hogs to the Wolds districts, where winter keep is more plentiful. The pig population of Holderness is high. Large herds of Essex, Large White and Wessex, or crosses having Large White blood in them, are kept on some holdings. The modern tendency is to concentrate on the Large White in view of the more exacting consumer requirements.

South Holderness, in common with many other East Coast areas, suffered badly from flooding in 1953 and, although there was no loss of human life, some 4,000 acres were inundated and many head of stock were lost. This area, however, is making a good recovery and most of it has been cropped this season.

D. J. Mortimer,
District Advisory Officer

The Mechanic on the Farm: 6. Testing Electrical Equipment

Actual repairs of the electrical equipment on the engines of tractors and other machines are best left to an expert, and, indeed, the most satisfactory treatment is often the fitting of a reconditioned replacement part obtained from the distributors of the equipment. Nevertheless, it is necessary in the first place to trace the particular component causing the trouble. A systematic search is the only way of investigating electrical faults, and a few simple testing instruments will help this orderly investigation. Some of these can be bought cheaply and some can be made up in the farm workshop.

Testing leads are perhaps the most useful and easily constructed pieces of equipment for the farm electrician. A few 3-foot lengths of insulated wire should be fitted with crocodile jaw terminals at either end. These crocodile jaws are made primarily for clipping on to the leaden terminal posts of batteries, but they can be clipped also to most shapes of metal. If a break in a wire or a bad connection is suspected, the part of the circuit which might be at fault can be bridged by one of these clip-ended wires. This is a handier, and more reliable, method than holding the wires in contact by the fingers.

This idea of a wandering, easily-connected wire can be extended to make a useful continuity tester. One end of a wire carries a crocodile clip, and the other is connected to the middle terminal of a brass lamp-holder of the kind which takes a single-contact bulb. A brass or steel point is soldered on to the outside of the lamp-holder. To use this tester, a motor car tail-lamp bulb of the same voltage as that of the system being tested is put into the lamp holder and the crocodile clip is clamped on to some well-earthed part of the engine. Then, if the sharp point of the tester is pierced through the insulation of the wire being tested, the lamp will light if the wire is alive. For testing in some parts of a circuit, the tester will have to be provided with its own battery.

On engines having battery-and-coil ignition, the tester can be used to examine the wire leading to the low tension contact on the distributor. It will also serve as an indicator in timing the engine, for if the tester point is held against the distributor contact and the engine is turned slowly, the bulb will light when the contact points are open. When the points are closed

the bulk of the current will pass across them rather than through the lamp bulb, so that the light will go out. If the lamp does continue to glow when the points are closed, it shows that they are not making good contact. This may be due to the points being dirty or pitted, or to looseness or a fracture in the breaker fittings.

In some situations it is more convenient to have the probing point of the tester on the end of a second flexible wire, rather than attached to the body of the lamp-holder. It may thus be worth while making up two testing sets: the one will have the probe on the body of the lamp-holder firm and convenient for use in spots which are easy to reach; the other with the more flexibly attached probe, will be better in awkward places, such as when dealing with the wiring behind the facia board of a tractor.

The field circuits in a generator can be tested for continuity by putting the tester in series with a field coil and a battery. They can also be tested for a possible short circuit to the framework of the generator.

If many storage batteries are in use on the farm, a hydrometer and a discharge-voltmeter will be useful, but these are not instruments which can be readily made in the farm workshop. The hydrometer – a calibrated float for measuring the specific gravity of the sulphuric acid electrolyte – gives a reliable indication of the state of charge of the battery only if acid of the correct concentration has been put into the battery in the first place, if there has been no loss of electrolyte by spilling, and if only water has been used to top up the cells. To make a complete trial, the voltage under discharge conditions must be tried as well. If the specific gravity of the electrolyte in one cell of a battery differs by more than 0.025 from that of the other cells, and also the voltage under discharge differs by more than 0.2 from the other, then the battery should be taken to an electrical repairer.

Open-circuit voltmeters are useless for testing the condition of batteries. A meter with a discharge shunt is needed, since this puts each individual cell under the same electrical load while the meter indicates the voltage in a particular cell.

H. J. Hine

National Pig Records The National Pig Records scheme for England and Wales, which was announced in the press in August, is now open to applicants. To join the scheme it is sufficient to get in touch with the pig recording officer for the area, who will call upon all new members to explain the scheme to them and to register their sows. Further information and the addresses of pig recording officers are obtainable from the Ministry's county offices and from county branches of the National Farmers' Union.

For a fee of 5s. for each litter born, members will have the advantage of information on the weights of their own litters and comparisons with local and national averages, grading results at the bacon factory (wherever possible), and certified extracts from the records showing the productivity of their stock. In addition, the pig recording officers will ensure that members who require advice are put in touch with the Ministry's advisory services.

New Provincial Director, West Midland Province Mr. E. Ll. Harry, formerly Deputy Provincial Director, Bangor, Wales, has been appointed Provincial Director of the West Midland Province of the National Agricultural Advisory Service, in succession to Mr. W. B. Mercer. Mr. Harry took up his new appointment on October 1.

BOOK REVIEWS

Insecticides and Colonial Agricultural Development. (Proceedings of the Sixth Symposium of the Colston Research Society). Edited by T. WALLACE and J. T. MARTIN. Butterworths Scientific Publications. 30s.

The Colston Research Society of the University of Bristol performs a very useful function with the symposia they hold every year, in that they provide a meeting place for the discussion of a number of scientific subjects on what may be described as neutral ground. This enables scientists to express their views more freely than when they are in their own learned societies.

This record of the papers and discussions of the Sixth Symposium is only of passing interest to the home farmer, but it is of the greatest importance to the development of agriculture in the Commonwealth. It is particularly interesting to note the attention now being given to the economics of pest and disease attack in agriculture; for instance, Dr. T. Wallace points out that insects are causing losses of at least £100 million a year in colonial agriculture, a theme which is elaborated further in Mr. W. J. Hall's opening paper. The subjects dealt with are research into insecticides, locusts, cotton pests, the design of field trials, the role of insecticides and biological control, storage losses due to insects, livestock pests, spraying machinery, and the problems of the insecticide trade.

All these papers are well written and obviously gave rise to interesting discussions. Features which struck the reviewer as being of particular interest were, as mentioned above, the economic approach, the importance of combining both chemical and biological control (as, for example, of the *Theraptis* bugs of coconut), the fact that fineness of particles in powders and sprays is not necessarily advantageous (it was shown that large particles of DDT were more effective than small ones), the suggestion that air-flow sprays may be more effective against red spider than high-volume spraying, the admirable explanation of the part played by the insecticide manufacturers, and the conclusion that factors other than insect attack may be limiting agricultural production. In the latter connection, Mr. Fennah held that bad management is more often responsible for low yields in the West Indies than are insect pests.

Though of more direct value to farmers in the tropics, this book is nevertheless of considerable general interest, since the experience gained under other conditions can frequently be useful in understanding human problems. The publishers are to be congratulated both on the admirable production of this book and on its publication so soon after the conference.

G.O.

A Handbook to Poultry Practice. KEITH WILSON. Poultry World. 10s. 6d.

In this book, which I understand to have been written in 1951, Mr. Keith Wilson has assembled a mass of information and practical tips which should be of considerable value both to the student and to the practical poultryman. The book is based on the syllabus of the National Certificate in Poultry Practice (N.C.P.), and covers a wide field, including chapters on housing, accounts and records, feeding, hygiene and marketing. In view of the inevitable compression, there are some points to which attention should be drawn if the reader is to get the best out of the book.

The section on cabinet incubators is written primarily from the point of view of the commercial hatchery, where the incubator room will contain several large machines, and in the case of an incubator room on a breeding station, some of the requirements stated may need to be modified. This applies particularly to the suggested placing of a ventilator shaft immediately over the incubator if the latter happens to have outlets on the top, since such an arrangement could lead to incorrect conditions inside the incubator.

When dealing with feedingstuffs, no reference is made to the dietary necessity for a certain amount of fibre. It is a pity that the table on page 109 should have been taken from The Ministry of Agriculture's Bulletin No. 48, *Rations for Livestock*, where the digestible nutrients and starch equivalents are calculated on the basis of ruminant digestibility trials. Data much more applicable to a specialized book on poultry could have been obtained from comparable figures in the Ministry's Bulletin No. 7, *Scientific Principles of Poultry Feeding*, since most of these are derived from digestibility trials with poultry. In the light of this, some amendments to the starch equivalent values are necessary if the tables are to be used in practice.

A list of further reading would enhance the value of the book, both to the student and to the poultryman who wish to pursue their subjects a little further. The publishers are to be congratulated on the clarity of their text and illustrations, but would do well in the case of factual books to include the date of writing, since some statements can only be acceptable in relation to it.

W.M.A.

The Behaviour and Social Life of Honeybees. C. R. RIBBANDS. Bee Research Association Ltd. 21s.

Of a trio of recent books on the social life and behaviour of the honeybee, this is the most fully documented and critical account of our present knowledge of the subject. Throughout the text there are references to the original sources, all of which are drawn together in a comprehensive bibliographical index at the end. Unfortunately, this index contains a considerable number of minor errors in the titles of papers written in German. Though they are not serious enough to mislead the reader in tracing the references, these mistakes should be rectified in any future edition of a work which is certain to have a wide circulation abroad as well as at home.

The aim of the author has been to give a comprehensive review to meet the needs of research workers, as well as to present information of interest to the practical beekeeper and the student of natural history. In this task he has largely succeeded, though the reader with no background knowledge of physical, chemical or statistical terms and symbols may have difficulty in following occasional sentences of the text and in interpreting some of the many otherwise excellent and informative text figures and tables.

The book falls naturally into four parts. Part I deals with the senses and glands which form the roots of behaviour, while Part II considers the individual behaviour of the bee in the field and the external factors by which it is influenced. Communication between honeybees is the subject of the third part, which gives a detailed account of the work of von Frisch and others on the dances of the worker bee and their interpretation as a means of imparting information about the direction and distance from the hive of sources of food. The final section is devoted to life within the hive and develops the idea of the significance of food sharing for the social organization and defences of the community.

The need for a detailed, documented survey of the considerable volume of information on the subject of bee behaviour—much of it inaccessible to all but the specialist in this field—has been apparent for some time. Mr. Ribbands and the Bee Research Association have met the need admirably by the writing and production of this book.

P.S.M.

Mushroom Science II. International Conferences on Mushroom Science. 12s.

The Second International Conference on Scientific Aspects of Mushroom Growing was held at Gembloux, Belgium, in June 1953, and the Proceedings of the Conference have now been published under the above title.

Contributions to the Conference came from many different countries, and in all 34 papers were read. Eighteen of these are printed in this book in English; the remainder in French. Fundametnal work on which reports were made included the use of radio-active phosphorus in experiments, and the use of ultra-violet radiation in the development of new strains. Methods of production in their own countries and some of the problems appertaining thereto were dealt with by representatives from Belgium, France, Great Britain, Germany, Denmark, Holland, and the U.S.A. Short composting is described in detail, and the need for accurate treatment of the material in its various stages is stressed.

No mushroom conference would be complete without reference to the treatment of pests and diseases, and contributions are made concerning the control of *Ditylenchus* spp. and also on the control of the principal diseases to which the crop is subject.

The publication, which may be obtained from the Mushroom Growers' Association, Yaxley, Peterborough, is a concise account of cultural practices and experimental work now in progress in the mushroom world and will be of interest and value to every grower.

A.D.H.

A Study of Grassland Costs in Cornwall, Devon and Dorset. (University of Bristol Economics Department Report No. 77). K. G. TYERS. 1s. 6d.

The importance of the grass crop in south-western England is clearly emphasized by this report, which points out that rather more than 72 per cent of the total acreage of crops and grass in this part of the country is occupied by grassland. Any study of grassland costs must therefore be of particular significance to farmers in the three counties, and this publication merits close study by all who are interested in better standards of grassland husbandry.

Although the data it contains (which was derived from fifty-nine farms included in the National Investigation into the Economics of Milk Production) is of necessity a trifle incomplete, nevertheless sufficient information has been gathered to give a most useful indication of the costs of producing grass in Devon, Dorset and Cornwall; counties which are so greatly favoured, both climatically and otherwise, for the growing of this all-important farm crop. The figures presented cover not only one analysis (for 1951-52), but also include a most interesting six years' summary (1946-52), which shows clearly how costs per acre have risen steadily over the whole of this period. The author rightly stresses the need for better management and utilization of both pastures and meadows if these higher costs of production are to be offset by increased output and greater net returns per acre.

A section of particular interest is that dealing with the actual physical production from the grasslands of the fifty-nine farms, which have given an average output of 12.6 cwt. of starch equivalent per acre—a figure which is in close accord with the generally accepted national average for England and Wales, but which is deplorably low in the light of modern scientific knowledge and up-to-date farm practice. It is encouraging to note, however, that on eight of the costed farms (14 per cent of the total) an output per acre of over 20 cwt. S.E. was achieved in 1951-52, and one hopes that this may provide some incentive and inspiration to those whose production was below average, and especially to the 18 per cent where output fell below 8 cwt. per acre.

The study concludes that there is ample scope on many farms for an increase in output per acre, both through better grassland management (including a much more liberal use of fertilizers and farmyard manure) and by better utilization of the existing grass. This is an opinion which will be heartily endorsed by all who have studied the grasslands of the South-West, for higher production from grass means lower overall feeding costs—a factor which is of particular significance in the light of present-day economic conditions. If this booklet helps in any way to stimulate further interest in improved methods of management and utilization of our grasslands, then its publication will have been well worth while.

Copies of the report may be obtained from the Provincial Agricultural Economist, 1 Courtenay Park, Newton Abbot, Devon.

G.M.D.

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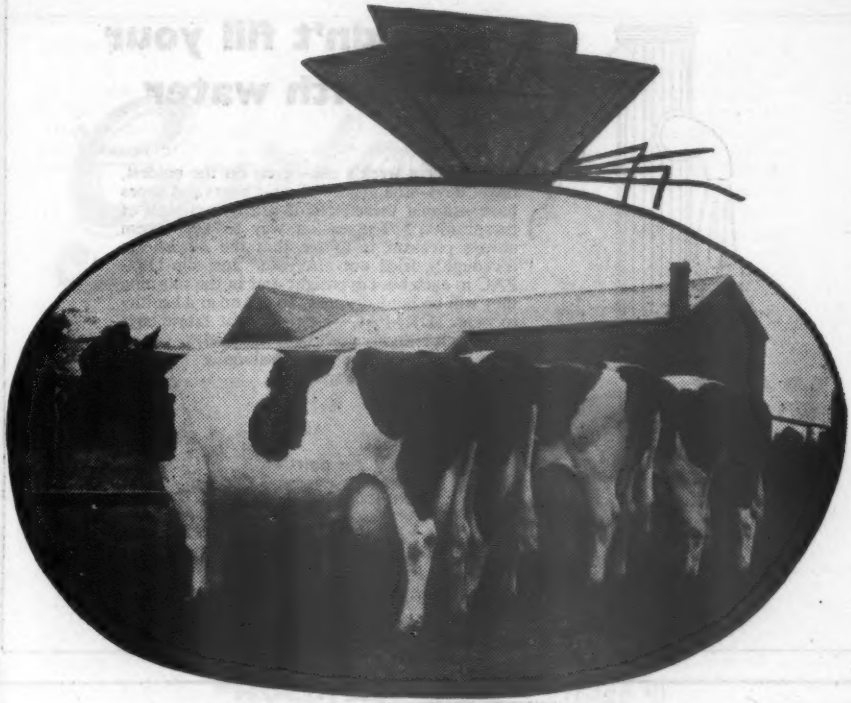

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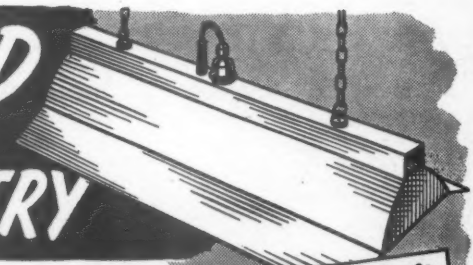

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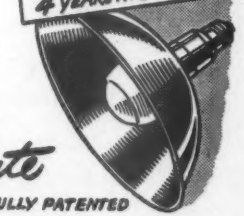

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